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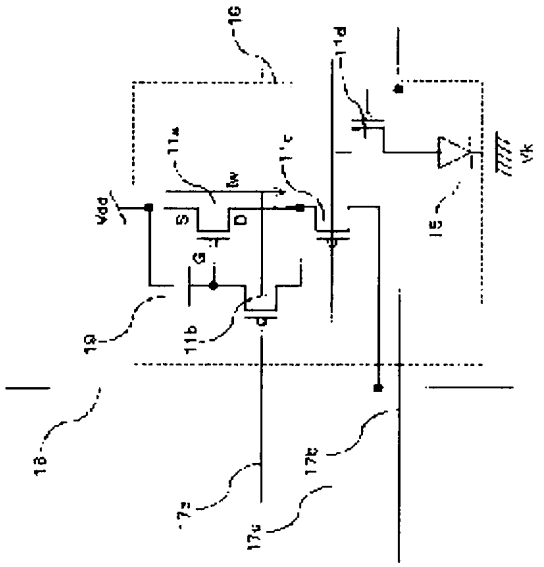
(54) EL (ELECTROLUMINESCENT) DISPLAY PANEL AND EL DISPLAY DEVICE AND ITS DRIVING METHOD AND METHOD FOR INSPECTING THE SAME DEVICE AND DRIVER CIRCUIT FOR THE SAME DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an EL display device having no unevenness in luminance in a display surface.
SOLUTION: In this EL display device, a TFT (thin film transistor) 11d is arranged between a TFT 11a for drive and an EL element 15, and a TFT 11b for short-circuiting the gate (G) terminal and the drain (D) terminal of the TFT 11a for drive, and a TFT 11c for supplying programmed currents to the TFT 11a for drive are arranged.



Drawings are not displayable due to the volume of the data (more than 200 drawings).

CLAIMS

[Claim(s)]
[Claim 1]An EL display panel comprising:
An EL element.
A transistor element for a drive which supplies current to said EL element.
A current supply source signal wire which supplies current programmed to said transistor element for a drive.
A feed voltage signal wire connected to the 1st switching element that connects said current supply source signal wire and said transistor element for a drive, the 2nd switching element that supplies voltage to a gate terminal of said transistor element for a drive, and said 2nd switching element.

[Claim 2]An EL display panel comprising:
An EL element.
The 1st transistor element that supplies current to said EL element.
The 2nd transistor element carried out in common in a gate terminal of said transistor element for a drive.
A current supply source signal wire which supplies current programmed to said 2nd transistor element, The 1st switching element that connects said current supply source signal wire and said 2nd transistor element, The 2nd switching element that supplies voltage to a gate terminal of said 1st transistor element, a feed voltage signal wire connected to said 2nd switching element, and said 1st transistor element and the 3rd switching element arranged between said EL elements.

[Claim 3]An EL display comprising:
The 1st substrate with which the 1st electrode was formed.
An EL layer formed on said 1st electrode.
The 2nd electrode formed on said EL layer.
An optical refraction means which has the periodic refractive index distribution arranged in the upper part of said 2nd electrode, and a light diffusing means arranged on said optical refraction means.

[Claim 4]An EL display comprising:
The 1st substrate with which the 1st electrode was formed.
An EL layer formed on said 1st electrode.
The 2nd electrode formed on said EL layer.
A light diffusing means which has been arranged in the upper part of said 2nd electrode, and has been arranged on a shading means which has a periodic opening, an optical refraction means which has the periodic refractive index distribution which was in agreement with an opening of said shading means, and said optical refraction means.

[Claim 5]A shading means and an optical refraction means which has the periodic refractive index distribution which was in agreement with an opening of said shading means characterized by comprising the following, An EL display, wherein it provides a light diffusing means arranged on said optical refraction means, and said light diffusion part is arranged or formed so that it may be located in the lower part of said opening.
The 1st substrate with which the 1st electrode was formed.
An EL layer formed on said 1st electrode.
The 2nd electrode formed on said EL layer.
A light diffusion part arranged or formed in the upper part of said 2nd electrode, and a periodic opening by which prescribed distance ****** arrangement was carried out in the upper part of said light diffusion part.

[Claim 6]The EL display according to claim 3, 4, or 5, wherein an optical refraction means is a prism sheet.
[Claim 7]The EL display according to claim 3, 4, or 5, wherein an optical refraction means is a microlens substrate.
[Claim 8]An EL display characterized by satisfying conditions of t >= -(1/8) root (n-n-1) when it has the following, distance to an interface to which said 1st substrate touches air from said EL layer is set to t (m) and a refractive index of said 1st substrate is set to n.
The 1st substrate with which a transparent electrode was formed.
An EL layer formed on said transparent electrode.
A reflector formed on said EL layer.

[Claim 9]The EL display according to claim 8, wherein the 1st substrate comprises a transparent substrate and a concave lens.
[Claim 10]A driver circuit of an EL display characterized by comprising the following.
The 1st reference current source that generates the 1st current.

Two or more 2nd reference current sources that generate said 1st current and current same in abbreviation.
Said 2nd reference current source and two or more 3rd reference current sources that generate current same in abbreviation.
A current magnification conversion method which changes a size of current which flows into wiring which sends current of said 3rd reference current source, and said wiring.

[Claim 11]The 1st reference current source that generates the 1st current, and two or more 2nd reference current sources that generate said 1st current and current same in abbreviation, Said 2nd reference current source and two or more 3rd reference current sources that generate current same in abbreviation, Wiring which sends current of said 3rd reference current source, and a current magnification conversion method which changes a size of current which flows into said wiring, A driver circuit of an EL display, wherein it provides a precharge circuit which makes potential of said wiring prescribed potential and the number [one / the number / a unit power supply which has said 3rd reference current source inside the 3rd reference current source based on input data] changes.
[Claim 12]The 1st reference current source that generates the 1st current, and two or more 2nd reference current sources that generate said 1st current and current same in abbreviation, Said 2nd reference current source and two or more 3rd reference current sources that generate current same in abbreviation, Wiring which sends current of said 3rd reference current source, and a current magnification conversion method which changes a size of current which flows into said wiring, A driver circuit of an EL display, wherein it provides a precharge circuit which makes potential of said wiring prescribed potential, and a current-supply circuit which slushes predetermined current into said wiring and said 1st current is changed by a voltage setting means arranged outside.
[Claim 13]A driver circuit of the EL display according to claim 10, 11, or 12, wherein power supply voltage of a driver circuit is abbreviated-in agreement in power supply voltage of an EL display.
[Claim 14]An EL element formed in matrix form, and the 1st transistor element that supplies current to said EL element, A current supply source signal wire which supplies current programmed to said 1st transistor element, The 1st switching element that connects said current supply source signal wire and said 1st transistor element, It is shown in an EL display which has a gate terminal of said 1st transistor element, and the 2nd switching element that short-circuits a drain terminal, The 1st operation that makes one said 1st and 2nd switching elements, and programs black display current on said current supply source line, The 2nd operation that detects current outputted to said current supply source line after said 1st operation, An inspection method of an EL display panel performing the 3rd operation that makes one said 1st and 2nd switching elements, and programs white display current on said current supply source line, and 4th operation that detects current outputted to said current supply source line after said 3rd operation.
[Claim 15]An EL display which is provided with the following and characterized by forming an opening in a prescribed spot of said reflection film at matrix form.
An EL layer formed in matrix form.
A transistor element for a drive which supplies current to said EL layer.
The 1st signal wire that supplies current or voltage programmed to said transistor element for a drive.
The 1st substrate that has the 1st switching element that connects said 1st signal wire and said transistor element for a drive, and a reflection film formed on said EL layer.

[Claim 16]An EL layer formed in matrix form.
The 1st switching element that connects the 1st signal wire that supplies current or voltage programmed to a transistor element for a drive which supplies current to said EL layer, and said transistor element for a drive, and said 1st signal wire and said transistor element for a drive.
Current from said transistor element for a drive is made not to be supplied to said EL layer by being a correcting method of an EL display provided with the above, and irradiating said opening with a laser beam.

[Claim 17]A correcting method of an EL display characterized by being shown in an EL display in which one electrode of an EL layer is a transparent electrode, irradiating said transparent electrode, and keeping said EL layer from emitting light by destroying deterioration or structure of an EL layer in material of said EL layer at least.
[Claim 18]An EL display panel which is provided with the following and characterized by controlling said 1st switching element to be in an OFF state when said 2nd switching element is an ON state.
An EL element.
A transistor element for a drive which supplies current to said EL element.
Said transistor element for a drive, and the 1st switching element arranged between said EL elements.
A source of reverse bias voltage supplied to the 2nd switching element connected to one terminal of said EL element, and one terminal of said 2nd switching element.

[Claim 19]The EL display panel according to claim 18, wherein a transistor element for a drive is P channel transistor element and the 2nd switching element is N channel transistor element.
[Claim 20]An EL display panel and the 1st gate driver circuit where the 1st signal wire that controls said 1st switching element was connected characterized by comprising the following, Provide the 2nd gate driver circuit where the 2nd signal wire that controls said 2nd switching element was connected, and said 1st gate driver circuit, An EL display, wherein it supplies a signal which makes said 1st signal wire turn said 1st switching element on and off and said 2nd gate driver circuit supplies reverse bias voltage to said 2nd signal wire.
An EL element formed in matrix form.
A transistor element for a drive which supplies current to said EL element.
Said transistor element for a drive, and the 1st switching element arranged between said EL elements.
The 2nd switching element connected to one terminal of said EL element.

[Claim 21]An EL element formed in matrix form.

A transistor element for a drive which supplies current to said EL element, said transistor element for a drive and the 1st switching element arranged between said EL elements, and the 2nd switching element connected to one terminal of said EL element.
Are a drive method of an EL display provided with the above, and the 1st signal that makes said 1st switching element turn on and off, and a reverse-bias-voltage signal supplied to said 2nd switching element have a relation of reverse polarity, and within said EL display panel, The 1st reverse-bias-voltage signal and the 2nd reverse-bias-voltage signal distribute, are impressed, and, as for said 1st reverse-bias-voltage signal and the 2nd reverse-bias-voltage signal, have a relation of reverse polarity.

[Claim 22]An EL display which it has the following, and two or more [of said common signal lines] are formed, and is characterized by being constituted so that said two or more EL elements can impress reverse bias voltage for every block.
An EL element.
A transistor element for a drive which supplies current to said EL element.
Said transistor element for a drive, and the 1st switching element arranged between said EL elements.
A source of reverse bias voltage supplied to common signal lines which carry out the 2nd switching element connected to one terminal of said EL element, and one terminal of two or more of said 2nd switching elements in common, and said common signal lines.

[Claim 23]The 1st operation characterized by comprising the following that is shown in an EL display and makes said 2nd switching element the one per pixel row, The 2nd operation that makes said 1st switching element and said 2nd switching element the one after said 1st operation, and writes current from a current supply source line in said transistor element for a drive, A drive method of an EL display performing 3rd operation that makes said 3rd switching element the one after said 2nd operation, and supplies current of said transistor element for a drive to said EL element.
An EL element formed in matrix form.
A transistor element for a drive which supplies current to said EL element.
A current supply source signal wire which supplies current programmed to said transistor element for a drive.
The 1st switching element that connects said current supply source signal wire and said transistor element for a drive, A gate terminal of said transistor element for a drive, the 2nd switching element that short-circuits a drain terminal, and said transistor element for a drive and the 3rd switching element formed between said EL elements.

[Claim 24]The 1st operation characterized by comprising the following that is shown in an EL display, makes said 2nd switching element the one per pixel row, and makes said 2nd transistor element an OFF state, The 2nd operation that makes said 1st switching element and said 2nd switching element the one after said 1st operation, and writes current from a current supply source line in said 2nd transistor element, The 3rd operation that makes said 3rd switching element the one after said 2nd operation, and supplies current of said 1st transistor element to said EL element, A drive method of an EL display performing 4th operation that makes said 3rd switching element turn on and off, and controls supply current to said EL element.
An EL element formed in matrix form.
The 1st transistor element that supplies current to said EL element.
The 2nd transistor element that had said 1st transistor element and a gate terminal communalized.
A current supply source signal wire which supplies current programmed to said 2nd transistor element, The 1st switching element that connects said current supply source signal wire and said 2nd transistor element, A gate terminal of said 2nd transistor element, the 2nd switching element that short-circuits a drain terminal, and said 1st transistor element and the 3rd switching element formed between said EL elements.

[Claim 25]An EL display panel comprising:
An EL element formed in matrix form.
The 1st transistor element that supplies current to said EL element.
The 2nd transistor element that had said 1st transistor element and a gate terminal communalized.
A current supply source signal wire which supplies current programmed to said 2nd transistor element, The 1st switching element that connects said current supply source signal wire and said 2nd transistor element, A gate terminal of said 2nd transistor element, and the 2nd switching element that short-circuits a drain terminal, Said 1st transistor element, the 3rd switching element formed between said EL elements, and the 4th switching element that short-circuits a gate terminal and a drain terminal of said 1st transistor element.

[Claim 26]An EL display panel comprising:
An EL element formed in matrix form.
The 1st transistor element that supplies current to said EL element.
The 1st switching element that supplies voltage to a gate terminal of said 1st transistor element.
A gate terminal of said 1st transistor element, the 2nd switching element that short-circuits a drain terminal, and said 1st transistor element and the 3rd switching element formed between said EL elements.

[Claim 27]An EL element formed in matrix form.
The 1st transistor element that supplies current to said EL element.
The 1st switching element that supplies voltage to a gate terminal of said 1st transistor element.
The 2nd switching element that short-circuits a gate terminal and a drain terminal of said 1st transistor element.
Said 1st transistor element and the 3rd switching element formed between said EL elements.
The 1st operation that is a drive method of an EL display provided with the above, and makes said 1st switching element and said 2nd switching element turn off, and makes said 3rd switching element one, The 2nd operation that makes said 1st switching element and said 3rd switching element turn off after said 1st operation, and said 2nd switching element makes one, and is made into a reset state of said 1st transistor element, The 3rd operation that makes said 2nd switching element and said 3rd switching

element turn off after said 2nd operation, and makes said 1st switching element one, and impresses voltage to a gate terminal of said 1st transistor element, Make said 1st switching element and said 2nd switching element turn off, and said 3rd switching element is made one, and 4th operation that supplies current of said 1st transistor element to said EL element is performed.

[Claim 28]An EL display panel and the 1st signal wire that controls said 1st switching element characterized by comprising the following, Provide a gate driver circuit where the 2nd signal wire that controls said 2nd switching element, and said 1st signal wire and the 2nd signal wire were connected, and said gate driver circuit, An EL display constituting so that an output which has at least one shift register circuit, and took logical sum of two or more outputs of said shift register circuit may be impressed to said 2nd signal wire.
An EL element formed in matrix form.
The 1st transistor element that supplies current to said EL element.
The 1st switching element that supplies current or voltage to a gate terminal of said 1st transistor element.
The 2nd switching element that short-circuits a gate terminal and a drain terminal of said 1st transistor element.

[Claim 29]An EL display comprising:
An EL display panel.
A memory measure which carries out the memory of the image data.
A calculating means which asks for a size of said image data.
A data inversion means to reverse image data read from said memory measure when a result of said calculating means is beyond a predetermined value.

[Claim 30]The 1st operation characterized by comprising the following that is shown in an EL display panel, and makes said 1st switching element turn off, and makes one the 2nd switching element and 3rd switching element, An inspection method of an EL display panel performing 2nd operation that detects current which makes one said 1st switching element and the 3rd switching element, and makes the 2nd switching element turn off, and flows into said 3rd switching element after said 1st operation.
An EL element formed in matrix form.
The 1st transistor element that supplies current to said EL element.
Said 1st transistor element and the 1st switching element arranged between said EL elements.
A gate terminal of said 1st transistor element, the 2nd switching element that short-circuits a drain terminal, and the 3rd switching element that supplies reverse bias voltage to said EL element.

[Claim 31]An EL element formed in matrix form, and the 1st transistor element that supplies current to said EL element, The 1st switching element that supplies program current or voltage to said 1st transistor element, A gate terminal of said 1st transistor element, and the 2nd switching element that short-circuits a drain terminal, The 1st signal wire that transmits a signal which turns said 1st switching element on and off, An EL display, wherein it provides the 2nd signal wire that transmits a signal which turns said 2nd switching element on and off and said 2nd signal wire is connected with the 1st signal wire of a pixel row chosen before arbitrary pixel rows.
[Claim 32]An EL element formed in matrix form, and the 1st transistor element that supplies current to said EL element, The 1st switching element that supplies program current or voltage to said 1st transistor element, A gate terminal of said 1st transistor element, and the 2nd switching element that short-circuits a source terminal, The 1st signal wire that transmits a signal which turns said 1st switching element on and off, Provide the 2nd signal wire that transmits a signal which turns said 2nd switching element on and off, and said 2nd signal wire, An EL display, wherein it is connected with the 1st signal wire of a pixel row chosen before arbitrary pixel rows, and said arbitrary pixel rows are constituted so that ON state voltage may be impressed to said 2nd signal wire at least one or more horizontal scanning periods ago.
[Claim 33]An EL element formed in matrix form, and the 1st transistor element that supplies current to said EL element, The 1st switching element that supplies program current or voltage to said 1st transistor element, The 2nd switching element and 3rd switching element that short-circuit a gate terminal and a drain terminal of said 1st transistor element, The 1st signal wire that transmits a signal which turns on and off said 1st switching element and the 2nd switching element, An EL display, wherein it provides the 2nd signal wire that transmits a signal which turns said 3rd switching element on and off and said 2nd signal wire is connected with the 1st signal wire of a pixel row chosen before arbitrary pixel rows.
[Claim 34]An EL element formed in matrix form, and the 1st transistor element that supplies current to said EL element, The 1st switching element that supplies program voltages to said 1st transistor element via a capacitor, A gate terminal of said 1st transistor element, and the 2nd switching element that short-circuits a drain terminal, Said 1st transistor element and the 3rd switching element formed between said EL elements, The 1st signal wire that transmits a signal which turns said 1st switching element on and off, An EL display, wherein it provides the 2nd signal wire that transmits a signal which turns said 2nd switching element on and off and said 2nd signal wire is connected with the 1st signal wire of a pixel row chosen before arbitrary pixel rows.

[Translation done.]

Drawings are not displayable due to the volume of the data (more than 200 drawings).

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]the EL display panel of this invention which displays a picture mainly with spontaneous light -- and it is related with information display devices, such as a cellular phone using these EL display panels, etc.
[0002]
[Description of the Prior Art]Since many liquid crystal display panels to a portable equipment etc. are adopted from the advantage of low power consumption with a thin shape, they are used for apparatus, such as a word processor, a personal computer, television (TV), the viewfinder of a video camera, a monitor, etc.
[0003]
[Problem(s) to be Solved by the Invention]However, since liquid crystal display panels are not spontaneous optical devices, there is a problem that it cannot be displayed that a picture does not use a back light. Since predetermined thickness was required in order to constitute a back light, there was a problem that the thickness of a display module became thick. In order for a liquid crystal display panel to perform a colored presentation, it is necessary to use a light filter. Therefore, there was a problem that efficiency for light utilization was low.
[0004]
[Means for Solving the Problem]An EL display panel this invention is characterized by that comprises the following in order to solve an aforementioned problem.
EL element.
A transistor element for a drive which supplies current to said EL element.
A current supply source signal wire which supplies current programmed to said transistor element for a drive.
A feed voltage signal wire connected to the 1st switching element that connects said current supply source signal wire and said transistor element for a drive, the 2nd switching element that supplies voltage to a gate terminal of said transistor element for a drive, and said 2nd switching element.

[0005]
[Embodiment of the Invention]In order that each drawing may draw an understanding easily in this specification, there are an abbreviation or/and a part which carried out scaling. For example, with the sectional view of the display panel of drawing 7, the sealing film 73 etc. are illustrated thickly enough. In drawing 1, thin film transistors (TFT) which impress a signal to a picture element electrode are omitted. It is desirable to omit the phase films for phase compensation etc., etc. and for ** to add timely in the display panel of this invention. The above thing is the same also to the following drawings. The part which attached the same number or the sign has a same or similar gestalt, material, a function, or operation.
[0006]Especially the contents explained with each drawing are combinable with other examples, even if there is no notice. For example, a touch panel etc. can be added to the display panel of drawing 1, and it can be considered as drawing 19 and the drawing 49 information display device. A magnifying lens can be attached and viewfinders (refer to drawing 45), such as a video camera (refer to drawing 44), can also be constituted. The drive method of this invention explained with drawing 31, drawing 51, Drawing 104, Drawing 106, etc. is applicable to which display or display panel of this invention. It cannot be overemphasized that it cannot be limited to this although this invention mainly explains the active-matrix type display panel in which TFT was formed in each pixel, and it can apply also to a simple matrix type.
[0007]Thus, even if not illustrated in particular in the specification, the matter, contents, and specification which were indicated or explained in the specification and the drawing can be combined mutually, and can be indicated to a claim. It is because it is impossible to describe all the combination on specifications etc.
[0008]The organic electroluminescence display panel which is low power consumption, is high indication quality, and also is constituted by arranging the plurality of an organic electroluminescence (EL) element to matrix form as a display panel which can be slimmed down attracts attention.
[0009]As an organic electroluminescence display panel is shown in drawing 4, the organic stratum functionale (EL layer) 47 of at least one layer which consists of an electron transport layer, a luminous layer, an electron hole transporting bed, etc. on the glass plate 49 (array substrate) with which the transparent electrode 48 as a picture element electrode was formed, and the metal electrode (reflection film) 46 are laminated. The organic stratum functionale (EL layer) 47 emits light by applying the voltage of plus and the minus to the negative pole (cathode) of the metal electrode (reflector) 46 to the anode (anode) of the transparent electrode (picture element electrode) 48, namely, impressing a direct current between the transparent electrode 48 and the metal electrode 46. By using the organic compound which can expect a good luminescent characteristic for the organic stratum functionale, an EL display panel can be equal to practical use.
[0010]A cathode terminal, an anode electrode, or a reflection film may form and constitute the optical interference film which becomes an ITO electrode from a dielectric multilayer. A dielectric multilayer forms the dielectric film of a low refractive index,

and the dielectric film of a high refractive index in a multilayer by turns. That is, it is a dielectric mirror. This dielectric multilayer has a function which makes good the color tone of the light emitted from organic electroluminescence structure (screen effect). Other materials, such as IZO, may be sufficient as ITO. This matter is the same also to a picture element electrode.

[0011]Big current flows into the wiring 51 and 63 which supplies current to an anode or a cathode. For example, if the screen size of an EL display turns into 40 inch sizes, about [100A] current will flow. Therefore, it is necessary to produce the resistance of these wiring low enough. By this invention, wiring of an anode etc. is first formed with a thin film to this technical problem. And the thickness of a conductor is thickly formed in this thin film wiring with electrolysis plating art. The wiring itself or the metallic wiring which turns into wiring from **** is added if needed.

[0012]In order to supply big current to an anode or cathode wiring, it wires from a current supply source means to the neighborhood, such as said anode wiring, with the power wiring of a small current by high tension, and the low voltage and high electric current are converted the power and supplied using a DCDC converter etc. That is, it wires from a power supply to a power consumption object with high tension and small current wiring, and changes into a high current and the low voltage the neighborhood [for power consumption]. A DCDC converter, a transformer, etc. are illustrated as such a thing.

[0013]It is preferred to use for the metal electrode 46 what has small work functions, such as lithium, silver, aluminum, magnesium, indium, copper, or each alloy. It is preferred to use an aluminum-Li alloy especially, for example. A big conductive material or gold of a work function, such as ITO, etc. can be used for the transparent electrode 48. When gold is used as an electrode material, an electrode will be in a translucent state. Other materials, such as IZO, may be sufficient as ITO. This matter is the same also to a picture element electrode.

[0014]When vapor-depositing a thin film to the picture element electrode 46 etc., it is good to form an organic electroluminescence film in argon atmosphere. By forming a carbon film at 20 or more nm [50] or less on ITO as the picture element electrode 46, the stability of an interface improves and light emitting luminance and luminous efficiency will also become good.

[0015]It cannot be overemphasized that it may not limit to forming EL film by vacuum evaporation, and may form by an ink jet.

[0016]Hereafter, in order to make easy an understanding of the EL display panel structure of this invention, the manufacturing method of the organic electroluminescence display panel of this invention is explained first.

[0017]In order to improve heat dissipation nature of the substrate 49, it may form with sapphire glass. A thermally conductive good thin film or thick film may be formed. For example, using the substrate in which diamond membrane (DLC etc.) was formed is illustrated. Of course, a quartz glass substrate and a soda glass substrate may be used. In addition, that which used ceramic substrates, such as alumina, or used the metal plate which consists of copper etc. or by which vacuum evaporation or spreading coated the insulator layer with the metal membrane may be used. When using a picture element electrode as a reflection type, since light is emitted from the direction of the surface of a substrate as a substrate material, in addition to the transparence thru/or translucent material of glass, quartz, resin, etc., impermeable material, such as stainless steel, can also be used. This composition is illustrated to drawing 7. The cathode terminal is formed with the transparent electrodes 72, such as ITO.

[0018]Although it presupposed that a cathode etc. are formed with a metal membrane in the example of this invention, it may not limit to this and may form by transparent membranes, such as ITO and IZO. Thus, a transparent EL display panel can be constituted by using the electrode of both the anode of EL element 15, and a cathode as a transparent electrode. By raising transmissivity to about 80%, without using a metal membrane, displaying a character and a picture, it can constitute so that the other side of a display panel may almost be transparent and it may be visible.

[0019]It cannot be overemphasized that a substrate may use a plastic plate. It can be hard to break a plastic plate, and since it is lightweight, it is the optimal as a substrate for display panels of a cellular phone. As for a plastic plate, it is preferred to paste an auxiliary substrate together to one field of the base board used as a core material with adhesives, and to use as a laminated circuit board. Of course, these substrate 321 grades may not be limited to a board, and a with a 0.3 mm or less 0.05 mm or more thickness film may be sufficient as them.

[0020]As a substrate of a base board, it is preferred to use alicyclic polyolefin resin. A single board with a thickness of 200 micrometers of ARTON by Japan Synthetic Rubber Co., Ltd. is illustrated as such alicyclic polyolefin resin. The hard court layer which has heat resistance, solvent resistance, or a moisture permeability-proof function in one field of a base board, And the substrate (or a film or a film) of the assistance which consists of polyester resin, polyethylene resin, or polyether sulfone resin etc. in which the gas barrier layer with an infiltrative-proof function was formed is arranged.

[0021]When it constitutes the substrate 49 from a plastic as mentioned above, the substrate 49 consists of a base board and an auxiliary substrate. The auxiliary substrate (or a film or a film) which consists of polyether sulfone resin etc. in which the hard court layer and the gas barrier layer were formed in the field of another side of a base board like the above-mentioned is arranged. It is preferred to make it the angle of the optical lagging axis of an auxiliary substrate and the optical lagging axis of an auxiliary substrate to make turn into 90 degrees. A base board and an auxiliary substrate are pasted together via adhesives or a binder, and let them be a laminated circuit board.

[0022]It is preferred to use as adhesives what consists of acrylic resin with UV (ultraviolet rays) hardening type. As for an acrylic resin, it is preferred to use what has a fluorine group. In addition, the adhesives or the binder of an epoxy system may be used. As for the refractive index of adhesives or a binder, it is preferred to use or more 1.47 1.54 or less thing. It is preferred to make it refractive index difference with the refractive index of the substrate 49 become 0.03 or less. especially -- adhesives -- previously -- written **** -- it is preferred to add optical dispersing agents, such as titanium oxide [like], and to make it function as a light scattering layer.

[0023]When pasting an auxiliary substrate and an auxiliary substrate together to a base board, it is preferred to make into 120 degrees or less the angle which the optical lagging axis of an auxiliary substrate and the optical lagging axis of an auxiliary substrate make 45 degrees or more. It is good to make it still more desirable 100 degrees or less 80 degrees or more. By using this range, the phase contrast generated with polyether sulfone resin etc. which are an auxiliary substrate and an auxiliary substrate can be thoroughly negated within a laminated circuit board. Therefore, the plastic plate for display panels can be treated now as an isotropic substrate without phase contrast. Therefore, the nonuniformity of the display panel by phase states differing does not occur with the composition which uses a circular light board.

[0024]By this composition, flexibility spreads remarkably compared with a film substrate or a film laminated circuit board with

phase contrast. That is, it is because linear polarization can be changed into elliptical polarization by combining a phase difference film as a design. If there is phase contrast in the substrate 49 etc., an error with a designed value will occur according to this phase contrast.
[0025]Here, as a hard court layer, polyester resin, epoxy system resin, urethane system resin, or acrylic resin can be used, and the 1st undercoat layer of a transparent conducting film is served both as a stripe like electrode or a picture element electrode.
[0026]As a gas barrier layer, organic materials, such as inorganic materials, such as SiO2 and SiOx, or poly vinyl alcohol, and polyimide, etc. can be used. As a binder, adhesives, etc., epoxy adhesive, polyester system adhesives, etc. other than acrylic which were described previously can be used. The thickness of a glue line shall be 100 micrometers or less. However, in order to smooth unevenness of the surfaces, such as a substrate, it is preferred to be referred to as not less than 10 micrometers.
[0027]It is preferred to use a with a not less than 40-micrometer thickness [400 micrometer] thing as the auxiliary substrate and auxiliary substrate which constitute the substrate 49. The unevenness or phase contrast at the time of melting extrusion molding called the die line of polyether sulfone resin can be low suppressed by the thickness of an auxiliary substrate and an auxiliary substrate being 120 micrometers or less. Preferably, the thickness of an auxiliary substrate shall be not less than 50 micrometers 80 micrometers or less.
[0028]Next, SiOx is formed in this laminated circuit board as an auxiliary undercoat layer of a transparent conducting film, and the transparent conducting film which consists of ITO which serves as a picture element electrode if needed is formed with weld slag art. An ITO film is formed as a static free if needed. Thus, the transparent conducting film of the manufactured plastic plate for display panels can realize sheet-resistance-values 25ohm/**, and 80% of transmissivity as the membrane characteristics.
[0029]In the thickness of a base board, 50 to 100 micrometers when thin, in the manufacturing process of a display panel, the plastic plate for display panels will curl by heat treatment. A good result is not obtained in connection of a circuit component. When a base board is not less than 200-micrometer500 micrometers or less in thickness with a single board, there is no modification of a substrate and it excels in smooth nature, and conveyance nature is good and, as for the transparent conducting film characteristic, is stabilized. Connection of a circuit component can also be made satisfactorily. As for especially thickness, not less than 250 micrometers 450 micrometers or less are good. It thinks because it has moderate pliability and smoothness. Other materials, such as IZO, may be sufficient as ITO. This matter is the same also to a picture element electrode.

[0030]When using organic materials, such as the above-mentioned plastic plate, as the substrate 49, it is preferred to form the thin film which consists of inorganic materials as a barrier layer also in the field which touches a light modulation layer. As for the barrier layer which consists of this inorganic material, forming with an AIR coat and an identical material is preferred. It cannot be overemphasized that the sealing substrate 41 as well as the substrate 49 is producible by art or composition.
[0031]When forming a barrier film on a picture element electrode or a stripe like electrode, in order to reduce the loss of the voltage impressed to a light modulation layer as much as possible, it is preferred to use a low dielectric constant material. For example, the amorphous carbon film (specific inductive capacity 2.0-2.5) which added fluoride is illustrated. In addition, the LKD series (LKD-T200 series (specific inductive capacity 2.5-2.7), LKD-T400 series (specific inductive capacity 2.0-2.2)) which JSR is manufacturing and selling is illustrated. LKD series is the spin spreading type which used MSQ (methy-silsesquioxane) as the base, and its specific inductive capacity is also low [as 2.0-2.7] preferred. In addition, inorganic materials, such as organic materials, such as polyimide, urethane, and an acrylic, SiNx, SiO2, may be sufficient. It cannot be overemphasized that such barrier film materials may be used for an auxiliary substrate.
[0032]By using the substrate 49 formed with the plastic, or 41, the advantage that it cannot divide and that a weight saving can be carried out can be demonstrated. There are also other advantages that press working of sheet metal can be carried out. That is, the substrate of arbitrary shape is producible by press working of sheet metal or cutting (see drawing 25). Arbitrary shape and thickness are processible by fusion or chemicals processing. For example, forming circularly, making it globular forms (curved surface etc.), or processing conical shape is illustrated. By press working of sheet metal, the unevenness 252 can be formed in one substrates face, and, simultaneously with manufacture of a substrate, formation of the diffusing surface or embossing can be performed.
[0033]It is also easy to form in the hole of the substrate 41 formed by carrying out press working of sheet metal of the plastic so that a back light or the gage pin of a cover substrate can be inserted. Electric circuits formed by thick film technique or a thin film technology in the substrate 49 and 41, such as a capacitor or resistance, may be constituted. By forming a crevice (not shown) in the substrate 41, forming the heights 251 in the substrate 49, and forming so that these crevice and heights can be inserted in exactly, it may constitute so that the substrate 41 and the substrate 49 can be unified by insertion.
[0034]When a glass substrate was used, the bank used when vapor-depositing EL to the periphery of the pixel 16 was formed. A bank (rib) is formed in the shape of heights using a resin material by 1.0-micrometer or more a thickness of 3.5 micrometers or less. It forms in not less than 1.5-micrometer a height of 2.5 micrometers or less still more preferably. ******** -- the bank (heights) 251 which consists of resin -- formation of the substrate 41 or 49 -- simultaneously, it is also producible. SOG material besides an acrylic resin and polyimide resin may be sufficient as bank material. When a bank carries out press working of sheet metal of the substrate 41 or the substrate 49, it forms the heights 251 of resin simultaneously (see drawing 25). This is a big effect generated by forming the substrates 41 and 49 by resin.
[0035]Thus, since production time can be shortened by forming a resin part simultaneously with a substrate, low-cost-izing is possible. The heights 251 are formed in dot form at a display area part at the time of manufacture of the substrate 49 etc. These heights 251 are good to form between adjacent pixels. These heights 251 hold the predetermined space of the substrate 41 and the substrate 49. Stripe shape besides the shape of ** which encloses a picture element electrode may be sufficient as bank shape.
[0036]Although it presupposed that the heights 251 which function as a bank are formed in the above example, it does not limit to this. For example, it is good also as investigating a picture element part by press working of sheet metal etc. (crevice). Formation forms the uneven part 252 and the heights 251 simultaneously with a substrate, and also a flat surface substrate is formed first and the method which presses by reheating and forms unevenness is contained after that.
[0037]The light filter of mosaic shape may be formed by coloring the substrates 41 and 49 directly. Art, such as ink jet printing, is used for a substrate, and a color, coloring matter, etc. are applied and are made to permeate. It is made to dry at an elevated

temperature after osmosis, and what is necessary is just to cover the surface with inorganic materials, such as resin, such as UV resin, silicon oxide, or nitrogen oxide. A film is applied with gravure printing technique, offset-printing art, and a spinner, and a light filter is formed with the semiconductor pattern formation art etc. to develop. A black matrix (BM) may be directly formed by being [it / using art / in the relation between a dark color, black, or the complementary color of the light to modulate besides a light filter]-similarly coloring. A crevice may be formed so that it may correspond to a pixel in a substrates face, and it may constitute so that a light filter, BM, or TFT may be embedded in this crevice. It is preferred to carry out the tunic especially of the surface with an acrylic resin. With this composition, there is also an advantage that flattening of the picture element electrode side etc. is carried out.

[0038]Resin of a substrate face may be electric-conduction-ized by a conductive polymer etc., and a picture element electrode or a cathode terminal may be constituted directly. A hole is made in a substrate still more greatly and the composition which inserts electronic parts, such as a capacitor, in this hole is also illustrated. The advantage which a substrate can constitute thinly is demonstrated.

[0039]A pattern may be freely formed by cutting the surface of a substrate. It may form by melting the periphery of the substrates 41 and 49. In the case of an organic electroluminescence display panel, the periphery of a substrate may be melted and closed in order to prevent penetration of the moisture from the outside.

[0040]As mentioned above, the drilling process to a substrate is easy by forming a substrate by resin. Press working of sheet metal etc. can constitute substrate shape freely. A hole can be made in the substrates 41 and 49, this hole can be filled up with electric conduction resin etc., and it can also be made to flow through the table and the reverse side of a substrate electrically. The substrates 41 and 49 can use as a multilayered circuit board or a double-sided board.

[0041]A current-carrying pin etc. may be inserted instead of electric conduction resin. It may constitute so that the terminal of electronic parts, such as a capacitor, can be fitted over the formed hole. The circuit wiring by a thin film, a capacitor, a coil, or resistance may be formed in a substrate. That is, it is good also considering the substrate 41 and 49 self as a multilayer wiring board. Multilayering consists of those of pasting a thin substrate together. One or more of the substrates (film) to stretch may be colored.

[0042]A color and coloring matter are added to a substrate material, it can be colored the substrate itself or a filter can be formed. A serial number can also be formed simultaneously with substrate production. It can prevent malfunctioning from that of light being irradiated by the loaded IC chip by coloring only portions other than a viewing area.

[0043]The half of the viewing area of a substrate can also be colored a different color. This should just apply resin board processing technology (injection processing, complexion processing, etc.). The half of a viewing area can also be made into different EL layer thickness from that of using the same processing technology. An indicator and a circuit part can also be formed simultaneously. It is also easy to change the substrate thickness of a viewing area and a driver loading field.

[0044]A micro lens can also be formed in the substrate 41 or the substrate 49 so that it may correspond to a pixel, or so that it may correspond to a viewing area. A diffraction grating may be formed by processing the substrates 41 and 49. Unevenness more detailed enough than pixel size is formed, an angle of visibility can be improved or view angle dependence can be given. Processing of such arbitrary shape, ultra-fine processing technology, etc. are realizable with the La Stampa art which OMRON Corp. developed and which carries out micro-lens formation.

[0045]As for the substrates 41 and 49, the stripe like electrode (not shown) is formed. An antireflection film (AIR coat) is formed in the field where a substrate touches air. When the polarizing plate etc. are not stuck on the substrates 41 and 49, an antireflection film (AIR coat) is directly formed in the substrates 41 and 49. When other components, such as a polarizing plate (polarization film), are stuck, an antireflection film (AIR coat) is formed in the surface of the component, etc.

[0046]Although it explained as a center that the substrates 41 and 49 formed the above example with a plastic, it does not limit to this. For example, even if the substrates 41 and 49 are a glass substrate and a metal substrate, press working of sheet metal, cutting, etc. can form or constitute the uneven part 252, the heights 252, etc. The coloring to a substrate, etc. are possible. Therefore, the explained matter is not limited to a plastic plate. It does not limit to a substrate, either. For example, a film or a sheet may be sufficient.

[0047]In order to prevent or control adhesion of the garbage to the surface of a polarizing plate, it is effective to form the thin film which consists of fluoro-resins. Conductor films which have a hydrophilic group for electrostatic prevention, such as a thin film, a conductive polymer film, and a metal membrane, may be applied or vapor-deposited.

[0048]The polarizing plate (polarization film) arranged or formed in the light incidence face or light emitting surface of the display panel 82 may not be limited to what is made into linear polarization, and may serve as elliptical polarization. Two or more polarizing plates may be stretched, a polarizing plate and a phase difference plate may be combined, or what was stretched may be used.

[0049]As a main material which constitutes a polarization film, a TAC film (triacetyl cellulose film) is the optimal. A TAC film is because it has the outstanding optical property, surface smoothness, and processing suitability.

[0050]The composition which forms an AIR coat with dielectric monolayer or a multilayer film is illustrated. In addition, resin of the low refractive index of 1.35-1.45 may be applied. For example, the acrylic resin of a fluorine system, etc. are illustrated. Especially the characteristic has [a refractive index] good or more 1.37 1.42 or less thing.

[0051]An AIR coat has the composition of three layers, or two-layer composition. In the case of three layers, it is used in order to prevent reflection in the wavelength band region of large visible light. This is called a multi-coat. In a two-layer case, it is used in order to prevent reflection in the wavelength band region of specific visible light. This is called V coat. A multi-coat and V coat are properly used according to the use of a display panel. Not the thing to limit more than two-layer but one layer may be sufficient.

[0052]In the case of a multi-coat, optical thickness laminates nd1=lambda/2, and magnesium fluoride (MgF2) nd1=lambda/4, and forms an aluminum oxide (aluminum2O3) for nd=lambda/4, and a zirconium (ZrO2). Usually, a thin film is formed as a value of 520 nm or the neighborhood of those as lambda.

[0053]In the case of V coat, nd1=lambda/4 or yttrium oxide (Y2O3), and magnesium fluoride (MgF2) are laminated nd1=lambda/4, and it forms silicon monoxide (SiO) for optical thickness nd1=lambda/4, and magnesium fluoride (MgF2). It is better to use Y2O3, when modulating blue glow, since SiO has an absorption band region in the blue side. Since the direction of Y2O3 is stable also

from the stability of a substance, it is desirable. SiO2 thin film may be used. Of course, it is good also as an AIR coat using resin of a low refractive index, etc. For example, acrylic resins, such as fluoride, are illustrated. As for these, it is preferred to use an ultraviolet curing type.

[0054]In order to prevent static electricity from being charged by the display panel, it is preferred that hydrophilic nature consists of good materials in substrate materials, such as to apply resin of hydrophilic nature to the surfaces, such as light guide plates, such as a cover substrate, and the display panel 82, or a panel.

[0055]The thin film transistor (TFT) as two or more switching elements or current control elements is formed in 1 pixel. TFT to form may be the same kind of TFT, and like TFT of P channel type and N channel type, although it may be TFT of a different kind, a switching transistor and the transistor for a drive of the thing of like-pole nature are desirably desirable. The structure of TFT is not limited by planer type TFT, and may also depend that in which a stagger type or a reverse stagger type may be used, and the impurity range (sauce, drain) was formed using the self aryne method on a non-self aryne method.

[0056]The EL display device 15 of this invention has EL structure by which ITO and one or more sorts of organic layers which serve as a hole injection electrode (picture element electrode) on a substrate, and an electron injection electrode were laminated one by one. TFT is provided in said substrate.

[0057]In order to manufacture EL display device of this invention, the array of TFT is first formed on a substrate at desired shape. And ITO which is a transparent electrode as a picture element electrode on a flattening film is formed and patterned by a sputtering technique. Then, an organic electroluminescence layer, an electron injection electrode, etc. are laminated.

[0058]What is necessary is just to use the usual polycrystalline silicon TFT as TFT. TFT is provided in the end of each pixel of EL structure, and the size is about 10-30 micrometers. The sizes of a pixel are 20 micrometers x 20 micrometers - 300 micrometers x about 300 micrometers.

[0059]The wiring electrode of TFT is provided on a substrate. Although there is a function for the resistance of a wiring electrode to be low, it to electrically connect a hole injection electrode, and to hold down resistance low and that in which the wiring electrode contains any one sort of aluminum, aluminum and a transition metal (however, except for Ti), Ti, or the titanium nitride (TiN) or two sorts or more is generally used, In this invention, it is not restricted to this material. What is necessary is just to be usually about 100-1000 nm as thickness of the whole which combined the hole injection electrode used as the ground of EL structure, and the wiring electrode of TFT, although there is no restriction in particular.

[0060]An insulating layer is provided between the wiring electrode of TFT11, and the organic layer of EL structure. That in which the insulating layer formed inorganic system materials, such as silicon oxide of SiO2 grade, and silicon nitride, with weld slag or vacuum deposition, As long as the coat etc. of resin system materials, such as a silicon oxide layer formed by SOG (spin one glass), photoresist, polyimide, and an acrylic resin, have insulation, they may be any. Polyimide is especially preferred. An insulating layer also plays the role of the anticorrosion and the waterproof film which protects a wiring electrode from moisture or corrosion.

[0061]The light emission peak of EL structure may be two or more. As for EL display device of this invention, green and a blue light part are obtained with the combination of EL structure of blue-green luminescence, and a green transmission layer or a blue transmission layer, for example. A red light part can be obtained by the fluorescence conversion layer which changes bluish green luminescence of EL structure of blue-green luminescence, and this EL structure into the wavelength near red.

[0062]Next, EL structure which constitutes the EL display device 15 of this invention is explained. EL structure of this invention is provided with the following.

The electron injection electrode which is a transparent electrode.

One or more sorts of organic layers.

Hole injection electrode.

An organic layer has a hole transporting bed of at least one layer, and a luminous layer, respectively, for example, has an electron injection transporting bed, a luminous layer, an electron hole transporting bed, and a hole injection layer one by one. There may not be any hole transporting bed. The organic layer of EL structure of this invention can be considered as various composition, it may omit electron injection and a transporting bed, may make it a luminous layer and one, or may mix a hole-injection transporting bed and a luminous layer. An electron injection electrode comprises the small metal, compound, or alloys of the work function preferably formed with vacuum deposition, such as vacuum evaporation and a sputtering technique.

[0063]Since it is the structure which takes out the light which emitted light from the hole injection electrode side as a hole injection electrode, ITO (tin dope indium oxide), IZO (zinc dope indium oxide), ZnO, SnO2, In2O3, etc. are mentioned, for example, but especially ITOIZO is preferred. The thickness of a hole injection electrode should just have the thickness more than [which can perform hole pouring enough] fixed, and it is usually preferred to be referred to as about 10-500 nm. In order to raise the reliability of an element, it is required for driver voltage to be low, but ITO of 10-30ohms / ** (50-300 nm of thickness) is mentioned as a desirable thing. When actually using it, the cross protection by reflection by hole injection electrode interfaces, such as ITO, should just set up the thickness and the optical constant of an electrode fully satisfy optical extraction efficiency and color purity.

[0064]Although a hole injection electrode can be formed with vacuum deposition etc., forming by a sputtering technique is preferred. It does not restrict and what is necessary is just to use inactive gas, such as Ar, helium, Ne, Kr, and Xe, or these mixed gas especially as sputtering gas.

[0065]An electron injection electrode comprises the small metal, compound, or alloys of the work function preferably formed with vacuum deposition, such as vacuum evaporation and a sputtering technique. In order to raise metallic element simple substances, such as K, Li, Na, Mg, La, Ce, Ca, Sr, Ba, aluminum, Ag, In, Sn, Zn, and Zr, or stability as a component of the electron injection electrode formed, it is preferred to use the alloy system of two ingredients and three ingredients containing them. As an alloy system, Ag-Mg (Ag:1 - 20at%), aluminum-Li (Li:0.3 - 14at%), In-Mg (Mg:50 - 80at%), aluminum-Ca (Ca:5 - 20at%), etc. are preferred, for example.

[0066]The thickness of an electron injection electrode thin film should just make electron injection the thickness more than [which can be performed enough] fixed, and should just set it to 1 nm or more preferably 0.1 nm or more. Although there is no restriction in particular in the upper limit, the thickness is just usually about 100-500 nm.

[0067]A hole injection layer has a function which makes easy pouring of the electron hole from a hole injection electrode, and an

electron hole transporting bed has a function which bars the function and electron which convey an electron hole, and is also called an electric charge pouring layer and a charge transport layer.
[0068]An electron injection transporting bed is provided when the electron injection transportation function of the compound used for a luminous layer is not so high, and it has a function which bars the function which makes easy pouring of the electron from an electron injection electrode, the function to convey an electron, and an electron hole. A hole injection layer, an electron hole transporting bed, and an electron injection transporting bed increase - Make the electron hole and electron which are poured in to a luminous layer shut up, make a recombination area optimize, and improve luminous efficiency. An electron injection transporting bed may be separately provided in a layer with a pouring function, and a layer with a transportation function.
[0069]Although the thickness of a luminous layer, the thickness which combined the hole injection layer and the electron hole transporting bed, and the thickness in particular of an electron injection transporting bed are not limited but it changes also with formation methods, it is usually preferred to be referred to as about 5-100 nm.
[0070]What is necessary is just to make them into comparable as the thickness of a luminous layer or 1 / about 10 to 10 times, although the thickness of a hole injection layer and an electron hole transporting bed and the thickness of an electron injection transporting bed are based on the design of a recombination-radiation field. As for the thickness of a hole injection layer and an electron hole transporting bed, and each thickness in the case of dividing an electronic injection layer and an electron transport layer, it is [a pouring layer / 1 nm or more and a transporting bed] preferred to be referred to as not less than 20 nm. The maximum of the thickness of the pouring layer at this time and a transporting bed is [in a pouring layer] usually about 100 nm at about 100 nm and a transporting bed. It is also the same as when providing two layers of pouring transporting beds about such thickness.
[0071]By what thickness is controlled for taking into consideration the carrier mobility and carrier density (decided by ionization potential and electron affinity) of the luminous layer and electron injection transporting bed to combine, or a hole-injection transporting bed. It is possible to design a recombination area and a luminous region freely, and design of the luminescent color, control of the light emitting luminance and the emission spectrum by the cross protection of two electrodes, and control of the spatial distribution of luminescence are enabled.
[0072]The luminous layer of EL element 15 of this invention is made to contain the fluorescence substance which is a compound which has a luminescence function. Tris(8-quinolinolato) aluminum which is indicated by JP,63-264692,A etc. as this fluorescence substance, for example [Alq3] A blue-green luminescent material which is indicated by the metal complex coloring matter of **, JP,6-110569,A (phenyl anthracene derivative), a 6-114456 gazette (tetra aryl ethene derivative), JP,6-100857,A, the JP,2-247278,A, etc. is mentioned.
[0073]The organic EL device 15 of blue light is good to use for the material of a luminous layer "DMPhen (Triphenylamine)" whose luminous wavelength is about 400 nm. Under the present circumstances, it is preferred that a band gap adopts the same material as a luminous layer as an electronic injection layer (Bathocuproine) and a hole injection layer (m-MTDATXA) in order to raise luminous efficiency. Only by a band gap using 3.4 eV and large DMPhen for a luminous layer, it is because an electron remains in an electronic injection layer, an electron hole remains in a hole injection layer and the recombination of an electron and an electron hole does not happen easily due to a luminous layer. The luminescent material provided with an amine group like DMPhen is solvable by moving the energy excited in DMPhen to a dopant to the technical problem that structure is unstable and it is hard to extend the life-span of [it], and making light emit from a dopant.
[0074]As an EL material, luminous efficiency can be improved by using a phosphorescence luminescent material. The external quantum efficiency of firefly luminescence material is about 2 to 3%. Since a phosphorescence luminescent material reaches to about 100% to the firefly luminescence material being 25% in internal quantum efficiency (efficiency which changes the energy by excitation to light), external quantum efficiency becomes high.
[0075]It is good for the host material of the luminous layer of an organic EL device to use CBP. The phosphorescence luminescent material of red (R) or green (G) blue (B) is doped here. All the doped materials contain Ir. R material is good for Btp2Ir (acac) and G material to use 2(ppy)Ir (acac), and for B material to use FIrpic.
[0076]To a hole injection layer and an electron hole transporting bed, for example JP,63-295695,A, JP,2-191694,A, JP,3-792,A, JP,5-234681,A, The various organic compounds indicated in JP,5-239455,A, JP,5-299174,A, JP,7-126225,A, JP,7-126226,A, JP,8-100172,A, and EP0650955A1 grade can be used. It is preferred to use a vacuum deposition method for formation of a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, since a homogeneous thin film can be formed.
[0077]Hereafter, it explains in more detail about the manufacturing method and structure of an EL display panel of this invention. As explained above, TFT11 which drives a pixel to the array substrate 49 is formed first. One pixel comprises four pieces or five TFT(s). Current programming of the pixel is carried out and the programmed current is supplied to EL element 15. Usually, the value by which current programming was carried out is held as a pressure value at the storage capacitance 19. Pixel configurations, such as combination of this TFT11, are explained later. Next, the picture element electrode as a hole injection electrode is formed in TFT11. The picture element electrode 48 is patternized by photo lithography. In order to prevent the image quality deterioration by a phot conductor phenomena (it is henceforth called contest a phot) generated by carrying out light incidence to the lower layer of TFT11, or the upper layer TFT11, a light-shielding film is formed or arranged.
[0078]current programming impresses program current to a pixel from the source driver circuit 14 (or -- absorbing from a pixel to the source driver circuit 14), and makes the signal value equivalent to this current hold to a pixel The current corresponding to this held signal value is sent through EL element 15 (or it slushes from EL element 15). That is, the current which is programmed with current and carries out considerable (correspondence) to the programmed current is sent through EL element 15.
[0079]On the other hand, a voltage program impresses program voltages to a pixel from the source driver circuit 14, and makes the signal value equivalent to this voltage hold to a pixel. The current corresponding to this held voltage is sent through EL element 15. That is, it programs on voltage, and voltage is transformed into a current value within a pixel, and the current which carries out considerable (correspondence) to the programmed voltage is sent through EL element 15.
[0080]What is necessary is to use the pentacene molecule which consists of carbon and hydrogen, and just to form an electronic

thin film by processing the surface which forms an organic semiconductor, in order to form TFT in a plastic plate. This thin film possesses sufficient semiconductor characteristic suitable for electron device manufacture while having one 100 times [20 to] the size of the conventional crystal grain of this.

[0081]When pentacene grows on a silicon substrate, it has the tendency to adhere to a surface impurity. For this reason, growing up becomes irregular and it becomes a crystal grain which is too small for manufacturing a quality device. In order to grow up a crystal grain more greatly, it is good to apply first the monolayer "molecule buffer" of the molecule called a cyclohexene on a silicon substrate. In "sticky sites (place which adheres easily)" on silicon, for a wrap reason, this layer can do the clean surface, and it grows up to be even a crystal grain in which pentacene is very big.

[0082]By using the thin film of these big new crystal grains, the flexible transistor (TFT) using pentacene of the large-sized crystal grain is producible. A transistor (TFT) can be manufactured by applying a liquefied material at a temperature low for mass production of such a flexible transistor.

[0083]It may heat and semiconductor membrane may be formed, after forming in the metal thin film and island shape which serve as a gate on a substrate and vapor-depositing or applying an amorphous silicon film on this. Semiconductor membrane crystallizes good into the portion formed in island shape. Therefore, mobility becomes good.

[0084]It is preferred to adopt the structure called a static induction transistor (SIT) as an organic transistor (TFT). Pentacene of an amorphous state is used. The mobility of an electron hole is lower than 1x10-cm2/Vs and the crystallized pentacene. However, a frequency characteristic can be improved by adopting SIT structure. The thickness of pentacene has preferred or more 100 thing set to 300 nm.

[0085]A p type field effect transistor may be sufficient as organic TFT. TFT can be formed on a plastic plate. As for the pentacene which can constitute a flexible TFT type display panel, since it is possible to bend the whole plastic plate, it is preferred to consider it as a polycrystalline state. It is preferred to use PMMA for the material of gate dielectric film. A naphthacene may be used for the active layer of an organic transistor.

[0086]If oxygen plasma and O2 Usher are used at the time of washing, ashing also of the flattening film 71 of the periphery of the picture element electrode 48 will be carried out simultaneously, and the periphery of the picture element electrode 48 will be scooped out. In order to solve this technical problem, in this invention, the edge protective film 81 which consists picture element electrode 48 periphery of acrylic resins as drawing 8 shows is formed. As a component of the edge protective film 81, the organic materials and the identical materials which constitute the flattening film 71, such as acrylic resin and polyimide resin, are illustrated, in addition inorganic materials, such as SiO2 and SiNx, are illustrated. In addition, it cannot be overemphasized that it may be aluminum2O3 etc.

[0087]The edge protective film 81 is formed so that after the patterning 48 of the picture element electrode 48 and between the picture element electrode 48 may be filled. Of course, it cannot be overemphasized that it is good also as the bank 3661 (spacer keep a metal mask from touching the picture element electrode 48 directly) of the metal mask at the time of forming this edge protective film 81 in or more 2 a height of 4 micrometers or less, and distinguishing organic electroluminescence material by different color with.

[0088]It is effective also in enlarging the picture element electrode 48 so that it may illustrate to Drawing 366 improving luminous efficiency. Drawing 366 forms the bank 3661 which makes an edge protective film serve a double purpose around the picture element electrode 48. The bank 3661 is formed in or more 2 a height of 4 micrometers or less. The bank 3661 functions as a spacer kept from touching the metal mask (not shown) picture element electrode 48 at the time of distinguishing organic electroluminescence material by different color with directly.

[0089]In this invention illustrated to Drawing 366, it puts on the picture element electrode 48, and the 2nd picture element electrode 3662 is formed in the bank 3661 in piles. In the 2nd picture element electrode 3662, it is formed with the picture element electrode 48 and an identical material. Of course, material may be changed. As for the 2nd picture element electrode, the picture element electrode 48 and an electrical link are taken. It is formed in the bank 3661 in piles. Therefore, a pixel numerical aperture becomes high.

[0090]EL film (47R (red), 47G (green), 47B (blue)) is formed on this 2nd picture element electrode 3662. Each EL film opens few crevices, and is formed, or piles up a periphery. The piled-up part hardly emits light. The aluminum film used as a cathode is formed on the EL film 47. In Drawing 366, the 2nd electrode is used as a reflector and, originally it is good also considering the reflection film 46 as a transparent electrode. That is, it is upper extraction of light.

[0091]In the composition of Drawing 366, the slant face of the bank 3661 is used as a pixel opening. Therefore, since the current density impressed to EL film can be fallen and an emission area becomes large, efficiency becomes good (a pixel numerical aperture improves substantially).

[0092]The method which raises hereafter the extraction efficiency of the light generated within other EL display panels is explained. Drawing 279 illustrates the technical problem of the conventional EL display. In Drawing 279, 2791 is illustrating the locus of light.

[0093]It reflects with the cathode 46 and the light generated by the EL film 47 is emitted from the substrate 49 with which the driver circuit 12 (14) was formed. This light 2791a emits the light which entered at an angle of predetermined from the substrate 49 to the interface of the substrate 49 and air. However, total internal reflection of the light 2791b which entered the angle beyond the critical angle theta will be carried out within the substrate 49. Scattered reflection of this light 2791b that carried out total internal reflection is carried out within the substrate 49, and it reduces display contrast.

[0094]The light 2791b which carried out total internal reflection is lost. The rate of the light used as this loss amounts to two thirds of the amounts of total luminous flux which EL element 15 generates. Therefore, reducing generating of the light 2791b links with improvement in the rate for Mitsutoshi directly.

[0095]The composition which solves this technical problem is the composition of Drawing 280. The refraction sheet (an optical refracting member or a light refracting plate) is attached on the sealing film 73 explained by drawing 7 etc. (it arranged or forms). The refraction part 2801 is formed on the triangle, the polygon, or the circle so that the refraction sheet 2801 may correspond to the pixel 16. This refraction part 2801 may form a reflection film in the portion (inner surface of the refraction part 2802) which the whole may constitute from a transparent member and is shown by a of Drawing 280. The interference film constituted by forming the dielectric film of a low refractive index besides metal membranes, such as aluminum and silver, and the dielectric

film of a high refractive index in a multilayer may be sufficient as a reflection film. Shape may be set up become a total reflection area by a Snell's law.
[0096]The flection 2802 may be directly formed not only in the composition which attaches what formed the flection 2802 in the refraction sheet on the sealing film 73 but in the sealing film 73. In lower extraction of light, substrate 49 self may be processed, and it may form the flection 2802. It may form or arrange on a sealing plate.
[0097]It may not limit circularly and a polygon and the shape of a screen may have [the shape of a slant face, or] as the shape of the flection 2802. Many needlelike projections crowded and could be formed. The flection 2802 is based on being formed in the periphery of the light-emitting part of the pixel 16. That is, if the numerical aperture of the pixel 16 is 30%, it will form in the nonluminescent part (getting it blocked 70% of portion) of the pixel 16. Of course, it cannot be overemphasized that the formation position of the flection 2802 may lap with a light-emitting position.
[0098]Although the flection 2802 is based on being formed in the periphery of the light-emitting part of the pixel 16, it is preferred to change the center section of the viewing area 21 somewhat by a periphery. In the center section of the viewing area 21, the flection 2802 is formed so that it may be arranged exactly at the periphery of the light-emitting part of the pixel 16. in the periphery of the viewing area 21, the flection 2802 was shifted outside from the center position of the light-emitting part of the pixel 16 -- it forms so that it may arrange (formation). Thus, by changing the formation position of the flection 2802 by the center section and periphery of a viewing area, generating of moire can be controlled and generating of color unevenness can be controlled.
[0099]Also by forming the position of the flection 2802 somewhat at random for every pixel, generating of moire can be controlled and generating of color unevenness can be controlled.
[0100]It may constitute so that the light which emitted light by EL element 15 may pass the inside of the flection 2802, and it may be refracted by this flection 2802 and it may be emitted to the front face of a panel. That is, the flection 2802 acts as prism. In this case, the flection 2802 needs to consist of light transmission material.
[0101]When the flection 2802 forms with light transmission material, it is effective to color this material. It is because the effect of the light filter which omits the zone of the light emitted from EL element 15 can be demonstrated. Therefore, the color purity of an EL display panel improves and it becomes good [a white balance]. When EL element 15 is white light, a light filter cannot be provided but this flection 2802 can be utilized as a light filter. Of course, it cannot be overemphasized that the flection 2802 which formed the light filter separately and was colored further may be formed or arranged. The flection 2802 or the refraction sheet 2801 may be colored directly. The flection 2802 or the refraction sheet 2801 may be formed by coloring material.
[0102]The EL layer of blue light may be formed in colorization of EL, and the blue glow which emits light may be changed into R, G, and B light by the color conversion layer (CCM: color change MIDI AMUZU) of R, G, and B. Of course, the RGB organic materials (EL material) using a pre SHIJIEN shadow mask may have good control of striking a ball in any direction, and a method may be adopted. The color EL display panel of this invention may use which these methods.
[0103]As a coloring matter, what distributed coloring matter or paints in resin may be used, and gelatin and casein may be dyed by acid dye like a light filter. Fluoran system coloring matter can be made to be able to color and can also be used. What is necessary is just to use not the thing that needs three colors of RGB but one or more arbitrary colors. A natural resin can be dyed using coloring matter. The material which distributed coloring matter in the synthetic resin can be used. Two or more kinds of combination may be sufficient as the range of selection of coloring matter in [those] one suitable sort from azo dye, anthraquinone dye, phthalocyanine dye, a triphenylmethane color, etc.
[0104]As for the component of the flection 2802 and the refraction sheet 2801, it is preferred to use polymer (2861). As polymer (2861), photo-curing type resin is used from points, such as an ease of a manufacturing process, and separation with a liquid crystal phase. The acrylic monomer which ultraviolet curing nature acrylic resin is illustrated as a concrete example, and carries out polymerization curing especially by UV irradiation, and the thing containing acrylic oligomer are preferred. The photoresist acrylic resin which has a fluorine group especially has little aging, and its lightfastness is also good.
[0105]As a polymers formation monomer which constitutes polymer (2861), 2-ethylhexyl acrylate, 2-hydroxyethyl acrylate, Neopentyl glycol door KURIRETO, a hexandiol JIAKU lied, They are diethylene glycol diacrylate, tripropylene glycol diacrylate, polyethylene-glycol diacrylate, trimethylolpropane triacrylate, pentaerythritol acrylate, etc.
[0106]As oligomer or a prepolymer, polyester acrylates, epoxy acrylate, polyurethane acrylate, etc. are mentioned.
[0107]May use a polymerization initiator, in order to polymerize promptly, and as this example, 2-hydroxy-2-methyl-1-phenylpropan-1-one ("DAROKYUA 1173" by Merck Co.), 1-(4-isopropylphenyl)-2-hydroxy-isobutane 1-one ("DAROKYUA 1116" by Merck Co.), 1-BIDOROKISHI cyclohexylphenyl ketone ("IRGACURE 184" by a tiba guy key company), benzyl methyl ketal ("IRGACURE 651" by Ciba-Geigy), etc. are hung up. In addition, a chain transfer agent, a photosensitizer, a color, a cross linking agent, etc. can be suitably used together as an optional component.
[0108]The matter about the above polymer (2861) is applied mainly with the manufacturing method of Drawing 286, Drawing 287, and Drawing 290. In the case of the manufacturing method of Drawing 288, the flection 2802 is formed with an inorganic material. Of course, it may be a case of Drawing 288 or may form with organic materials like polymer.
[0109]Arrangement of the flection 2802 is good to use the shape of a hexagon so that it may illustrate to Drawing 281. Of course, more than an octagon etc. may be sufficient. The flection 2802 is formed in the circumference of the light-emitting part of the pixel 16. Even when an EL display panel is observed by considering it as hexagon shape as mentioned above, and changing the viewpoint which sees a display screen, generating of color unevenness and a color shift can lessen dramatically. There are also little light-emitting position of the pixel 16 and generating of the moire by position gap of the flection 2802.
[0110]Drawing 281 showed the example of composition (vertical stripe composition) of having arranged the same color to the sliding direction of Screen 21. By forming the color arrangement of a pixel in mosaic shape, as shown in Drawing 282 (arrangement), even if it is when there are comparatively few dot numbers which constitute a display panel, the resolution of the oblique direction of a picture improves.
[0111]Two or more flections 2802 may be formed or arranged to the one pixel 16 so that it may illustrate to Drawing 283. In the example of Drawing 283, the pixel 16 has one picture element electrode, and the three flections 2801 (2801a, 2801b, 2801c) are formed to this one picture element electrode (arrangement). Of course, it has two or more picture element electrodes in the one pixel 16, and the flection 2801 may form to each picture element electrode, respectively (arrangement). Even if it divides a

picture element electrode into plurality to one picture element electrode, the decline in a numerical aperture is seldom produced. It is because TFT for a drive or switching, etc. are arranged to the periphery of a picture element electrode.
[0112]Of course, the one flection 2802 may be arranged to the one pixel 284 so that it may illustrate to Drawing 284 (formation). it illustrates to Drawing 285 (a) -- as -- one pixel -- two rows -- and the flection 2802 of plurality (Drawing 285 (a) 2x6 pieces) may be formed. As shown in Drawing 285 (b), two or more (Drawing 285 (b) three pieces) flections 2802 of polygonal shape, such as a hexagon, may be formed at one picture element electrode.
[0113]Hereafter, the manufacturing method which forms the flection 2802 (the refraction sheet 2801 may be included) is explained.
[0114]Drawing 286 shows the 1st example of this invention. First, the EL film 47 is formed in the substrate 49 with which 11 pixel TFT16, the driver circuits 12 and 14, etc. were formed. Formation may form a low molecule EL film by vacuum evaporation, and may form a polymers EL film with an inkjet method. An electrode is formed on the EL film 47 and the sealing film 73 is formed on this (Drawing 286 (a)). A sealing plate may be attached. About these matters, since other parts explain in detail, it omits here.
[0115]The manufacturing method indicated on the specifications of this invention is applied except the matter explained below. It cannot be overemphasized that it is applied to the following manufacturing methods or panels which were manufactured etc. also about the composition of EL element 15, a pixel configuration, array constitution, panel structure, a drive method, a drive circuit, etc. It cannot be overemphasized that an information display device, television, a monitor, a camera, etc. can be constituted using the panel etc. which were manufactured with the following manufacturing methods, either.
[0116]Next, as shown in Drawing 286 (b), an unhardened BORIMA material (transparent membrane 2861) is applied on the sealing film 73. As the polymeric material 2861, it is the material of the refraction part 2802 explained previously. Spreading may use which methods (PRIOR ART), such as offset printing, screen-stencil, spreading with a roller, and spreading with a spinner.
[0117]Predrying is put in and carried out to oven after spreading of the unhardened polymeric material 2861. Or the polymer 2861 is irradiated with a taper (ultraviolet rays (UV) and visible light may be sufficient), and the mobility of the polymeric material 2861 is stopped. Then, it pushes against the transparent membrane 2861, rotating the roller 2862 in which the shape of the refraction part 2802 was formed. Thus, the uneven shape of the roller 2862 is transferred to the transparent membrane 2861. The unevenness (crevice) 2863 which is equivalent to the transparent membrane 2862 at the refraction part 2801 makes it form by this transfer. The transparent membrane 2861 whole is irradiated with UV or visible light after formation of the uneven part 2863, and the transparent membrane 2861 is stiffened thoroughly.
[0118]Temperature control is important when polymerizing the transparent membrane 2861. Warming is carried out just over or below 60 degrees 40 degrees or more. Although ultraviolet rays (UV) are based also on spectral distribution, they carry out a for [8 seconds] grade exposure from 2 seconds by about two 20 to 30 mW/cm intensity. Such temperature and the exposure conditions of ultraviolet rays must be defined in consideration of add-in material of the transparent membrane 2861, etc. The surface becomes cloudy when conditions are unsuitable. It becomes detailed rugged form. In this invention, the ultrahigh pressure mercury lamp was used for the light source at the temperature of 50 **, the transparent membrane 2861 was irradiated with ultraviolet rays (irradiation intensity in a substrates face: 30mW/cm2) for 6 seconds, and the transparent membrane 2861 was stiffened.
[0119]The light source of ultraviolet rays (UV2902) may be arranged inside the roller 2862, the transparent membrane 2861 may be irradiated with UV in accordance with advance of the roller 2862, and it may be made to harden one by one. The source of release of UV2902 is separately established with the roller 2862, and the transparent membrane 2861 may be irradiated with UV and it may be made to harden one by one from this source of release in accordance with advance of the roller 2862. A reflection film etc. are formed in the required portion of the flection 2802. About the composition of a reflection film, since Drawing 280 explained, it omits.
[0120]The refraction part 2802 may be formed with the manufacturing method of Drawing 290. Since Drawing 290 (a) and (b) is the same as Drawing 286 (a) and (b), explanation is omitted. In Drawing 290 (c), La Stampa 2901 (press board) which consists of transparent materials is used. Unevenness of the refraction part 2802 and opposite shape is formed in the press board 2901. The press board 2901 is formed from transparent materials, such as silica glass. Unevenness of the press board 2901 is transferred by the transparent membrane 2861 by pushing this press board 2901 against the transparent membrane 2861.
[0121]Thus, the uneven shape of the press board 2901 is transferred to the transparent membrane 2861. The unevenness (crevice) 2863 which is equivalent to the transparent membrane 2862 at the refraction part 2801 makes it form by this transfer. The transparent membrane 2861 whole is irradiated with UV or the visible light 2902 via the press board 2901, and is made to harden the transparent membrane 2861 thoroughly after formation of the uneven part 2863.
[0122]It is preferred to form in the rugged surface of the press board 2901 the good film of the mold releasability which consists of material of the Ole Von system, etc. By forming the good thin film of such mold releasability in the rugged surface, the mold releasability of the transparent membrane 2861 and the press board 2901 becomes good, and manufacturing efficiency improves. Temperature controlling is also important for the press board 2901 and the transparent material 2861. As for the press board 2901, it is more preferred than the transparent membrane 2861 to make temperature low about 15 degrees from 5 times. As for mold releasability, the direction made the relation with a reverse temperature depending on the kind of transparent membrane 2861 may become good. Therefore, it is necessary to fully experiment and to define conditions.
[0123]As a ** form film, olefin system resin films, such as a silicon resin film, a fluoro resin film, polyethylene, and polypropylene, are illustrated, and what applied silicon resin and a fluoro-resin on the surface of the resin film is illustrated. If others penetrate ultraviolet rays and have a certain amount of pliability, they are [anything] good. For example, a glass substrate etc. can be used.
[0124]After removing the press board 2901 so that it may illustrate by 290 (d), the transparent membrane 2861 whole is irradiated with UV (visible light), and an unhardened resinous principle is stiffened thoroughly. Also in a heat-curing type case, this has the same transparent membrane 2861.
[0125]Although the transparent membrane 2861 presupposed that an ultraviolet curing type is used in the manufacturing method explained with Drawing 286, Drawing 290, etc., this invention is not limited to this. For example, it cannot be overemphasized that a thermoplastic type resin material, a heat-curing type resin material, resin materials, such as a room-temperature-setting type

etc. of 2 liquid type which it begins to harden by mixing 2 liquid, etc. can be used. In the above case, the polymer 2861 does not need to be a transparent material. The selection range of the polymeric material 2861 also spreads and epoxy system resin, phenol system resin, etc. can be used. In this case, after forming the unevenness 2863, heating, neglect, etc. are carried out and the flection 2802 is formed. Of course, the press board 2901 may be stiffened in the state where it pushed against the transparent membrane 2861. A reflection film etc. are formed in the required portion of the flection 2802. About the composition of a reflection film, since Drawing 280 explained, it omits.

[0126]Drawing 287 shows other examples of this invention. Since Drawing 287 (a) is the same as that of other examples, explanation is omitted.

[0127]In Drawing 287 (b), the heights 2871 are formed on the sealing film 73. It is made in agreement [the formation position of the heights 2871] with flection 2802 formation position. That is, it is a periphery of a pixel periphery or the light-emitting part of a pixel. In a liquid crystal display panel, it is a formation position of a black matrix (BM). The heights 2871 are formed using inorganic materials, such as SiO2 and SiNx. Organic materials may be used like the transparent membrane 2861. As a formation method of the heights 2871, an inorganic thin film or an organic thin film is vapor-deposited or applied by a thickness of 0.5-3 micrometers on the sealing film 73 or a sealing plate. A mask is formed on it and it etches with a negative or a positive using said mask (Drawing 287 (b)).

[0128]Next, the transparent membrane 2861 is applied to the whole viewing area 21 so that it may illustrate to Drawing 287 (c). Spreading may use which methods (PRIOR ART), such as offset printing, screen-stencil, spreading with a roller, and spreading with a spinner.

[0129]As for the resin to apply, it is preferred to set viscosity to 40 or less cp of 5 or more cp. That is, that which fell viscosity comparatively is used. The transparent membrane 2861 is smoothly formed along with the heights 2871. As mentioned above, in Drawing 287, the flection 2802 is formed by the heights 287 and the transparent membrane 2861. A reflection film etc. are formed in the required portion of the flection 2802. About the composition of a reflection film, since Drawing 280 explained, it omits.

[0130]In Drawing 287 (c), although a transparent membrane is applied to the whole viewing area 21, it may not limit to this, and the thin film which consists of inorganic materials may be vapor-deposited. The flection 2802 is formed by unevenness of the heights 2871 by vapor-depositing an inorganic material.

[0131]Drawing 288 shows other examples of this invention. Since Drawing 288 (a) is the same as that of other examples, explanation is omitted. In Drawing 288 (b), the metal mask 2881 is arranged on the sealing film 73 or a closure lid. As for the opening of the metal mask 2881, the sealing film 73 side has a large opening, and, on the other hand, the side is narrow.

[0132]The metal mask 2881 is produced with a magnetic body, and adsorbs the metal mask 2881 magnetically with a magnet from the rear face of the substrate 49. By magnetism, the metal mask 2881 is stuck without a substrate and a crevice.

[0133]In order to carry out the metal mask 2881 explained with Drawing 288 as [touch / the sealing film 73 / directly] (or contacting the sealing film 73 as much as possible, and twisting like), it forms a 1.5-3-micrometer-high projection in the rear face of the metal mask 2881. Or a 1.5-3-micrometer-high projection is formed in the surface of the sealing film 73 or a closure lid. This projection is formed in the part which does not vapor-deposit the EL film 47. For example, it is between the pixels which adjoined.

[0134]Inorganic materials, such as SiO2 and SiNx, are made to deposit via the metal mask 2881, as illustrated in Drawing 288 (b). A deposition part is a formation point of the flection 2802. Organic materials may be used like the transparent membrane 2861 instead of an inorganic material. The flection 2802 can be formed using the metal mask 2881 as mentioned above.

[0135]Drawing 280 showed the flections (or light reflection section) 2802, such as the shape of prism. However, this invention is not limited to this. For example, corresponding to the pixel 16, the micro-lens-like flection 2802 may be formed so that it may illustrate to Drawing 289. As for a micro lens, it is preferred to use the shape of a sine curve. Although forming circularly is preferred, it may not limit to this and may be boiled fish paste-like. The height of a micro lens has preferred not less than 15-micrometer thing set to 3100 micrometers or less.

[0136]vapor-depositing Ti to the soda glass substrate which becomes a basis of a microlens substrate -- photograph phosphorus -- it is gruffy and the circular window corresponding to a pixel is opened. Next, it dips in the melting liquid of the nitrate of univalent ion, and heat-treats at 400 degrees or more. At the time of heating, the positive ion under melting carries out isotropic diffusion into a glass substrate from an opening window, and ionic exchange is performed. If ionic exchange is carried out, the portion will produce refractive index distribution. Refractive indicees are 1.5-1.7. A micro lens is produced as mentioned above.

[0137]A micro lens is formed with the La Stampa art. This La Stampa art applies the method which OMRON Corp. has adopted as the method of micro-lens formation, the method which Matsushita Electric uses as a formation method of a microlens with the pickup lens of CD, etc. The flection 2802 of Drawing 289 can also be formed by a diffraction grating. Since other matters are the same in Drawing 280, explanation is omitted.

[0138]With the composition of Drawing 280, the refraction sheet is attached on the sealing film 73 (it arranged or forms). The refraction part 2801 is formed on the triangle, the polygon, or the circle so that the refraction sheet 2801 may correspond to the pixel 16. That is, although the refraction part 2801 presupposed that it is rugged form, this invention is not limited to this. For example, a crevice may be filled up with the refraction material 2802b so that it may illustrate to Drawing 362 (formation). Or heights may be filled up with the refraction material 2802a (formation).

[0139]The refraction part 2802a is formed with a high refractive index material (restoration), and the refraction part 2802b is formed with a low refractive index material (restoration). Or the refraction part 2802a may be formed with a low refractive index material (restoration), and the refraction part 2802b may be formed with a high refractive index material (restoration). Plantar-flexion chip box material chooses 2 magnesium flux, diacid-ized silicon, 3 aluminum oxides, 2 fluoridation cerium, or silicon monoxide. A high refraction material chooses ITO3 oxidation 2 yttrium, a zirconium dioxide, diacid-ized hafnium, 5 oxidation 2 tantalum, a cerium dioxide, a titanium dioxide, zinc sulfide, or IZO.

[0140]Organic materials may be sufficient although the above is an inorganic material. For example, the acrylic resin of a fluorine system is illustrated as a plantar-flexion chip box material. In addition, a fluid or gel can also be used. A refractive index is illustrated for gels, such as purity, silicon, and ethylene glycol, ethyl alcohol, methyl alcohol, etc. as or more 1.3 1.50 or less low

refractive index material, and fluids, such as methyl salicylate, are illustrated as a comparatively high refractive-index material. The refraction sheet 2801 is constituted by being filled up with these etc.

[0141]If the refraction sheet 2801 is formed as shown in Drawing 362, it will become planate at the sheet 2801 and will become easy to stick a polarizing plate etc. on this flat surface. It can perform easily coating the surface with UV resin beyond 6H, etc. Therefore, the surface of the sheet 2801 can be protected. The upper and lower sides of the refraction sheet 2801 may be attached upside down so that it may illustrate to Drawing 363. If constituted in this way, the refraction part 2802a can be prevented from getting damaged mechanically. 73 may not function as a sealing film but may be operated as a protective sheet (protective film).

[0142]It is the same also in the example of Drawing 289. The heights of the refraction part 2802a may be filled up with the refraction material 2802b so that it may illustrate to Drawing 364 (formation). Or the crevice of the refraction part 2802b may be filled up with the refraction material 2802a (formation).

[0143]Like Drawing 363, the upper and lower sides of the refraction sheet 2801 may be attached upside down so that it may illustrate to Drawing 365. If constituted in this way, the refraction part 2802a can be prevented from getting damaged mechanically. 73 may not function as a sealing film but may be operated as a protective sheet (protective film).

[0144]In Drawing 280, the refraction sheet 2801 was illustrated as heights were formed in the periphery of the pixel 16, but it is not limited to this. For example, as shown in Drawing 374, may be and it may arrange so that the heights of the refraction sheet 2801 may correspond to a pixel (formation). Specifically, heights have the shape of board chocolate formed in matrix form. In Drawing 374, the portion of A between the pixels 16 is an air layer (refractive index n= 1). The portion of B is a portion which consists of resin or an inorganic material (n= around 1.5 refractive indicees). Therefore, the light which emitted light by EL layer 47 enters into the refraction sheet 2801, and total internal reflection of a part of light emitted from this sheet 2801 is carried out by the interface C. Therefore, it is condensed and light is emitted from the refraction sheet 2801.

[0145]Although the example which condenses using a micro lens etc. was indicated above, this invention is not that of the straw matting limited to this. For example, Drawing 375 arranges or forms the prism sheet 2801a (these are also refraction sheets in this invention) on the sealing film 73. 3M company is manufacturing and selling such a prism sheet as illuminating devices of a liquid crystal display panel. As for a prism pitch, it is preferred to use not less than 10-micrometer a thing of 100 micrometers or less.

[0146]The diffusion sheet 3751 is arranged to the prism sheet 2801a at the optical outgoing radiation side. Although any of a diffusion board or a diffusion sheet may be sufficient, it explains as the diffusion sheet 3751 here. The diffusion sheet 3751 is a thing for [which cannot be seen] being made to carry out (being hard to be visible). When the dispersion performance of the diffusion sheet 3751 was high, mist came to have started the display screen of the EL display panel. Conversely, prism shape will look visual if low.

[0147]As an example of the diffusion sheet 3751, there is lot number lighting series 100MX of Kimoto, 100SX, 100SH, or 100S. The diffusion board of Plastic In a pipe can also be used. In addition, a diffraction grating, a microlens array, a SELFOC lens array, etc. are employable as the diffusion sheet 3751. That is, a diffusion board or the diffusion sheet 15 should just be an optical Robus filter.

[0148]The random light emitted from EL layer 47 is changed into the light which has directivity with the prism sheet 2801a. Although it was indicated as an existing directive light here, it is for being hard to indicate this to be what times directivity (implications that directivity is narrower than random light). This light passes the diffusion sheet 3751, diffuses it somewhat, and reaches an observer's eyes.

[0149]The prism on two or more pyramids corresponds to the one pixel 16 so that the prism sheet 2801a may be illustrated to Drawing 376. Prism may not be limited only to a pyramid and may be a triangular pyramid. It may be conical shape. further 6 -- pyramids -- it is also good to come out. It may be cylindrical. In Drawing 376, it is illustrating so that two or more prism 2801a may be exactly restored to the one pixel 16, but it may not limit to this, and may shift.

[0150]In Drawing 376, although the prism 2801a was a three dimension-like, as it does not limit to this and being illustrated to Drawing 378, it may be stripe shape (the shape of two dimensions). In this case, the prism sheets 2802a and 2802b of stripe shape are arranged so that it may abbreviated-intersect perpendicularly, so that it may illustrate to Drawing 377 (it forms).

[0151]The random light which generated the above example in EL element 47 was the composition or the method of making high luminosity which was made into an existing directive light using the refraction sheet 2802, or was condensed, and was seen from the front face of the panel.

[0152]Drawing 379 demonstrates the condensing function of a lens, increases light volume emitted from the front face of a display panel, and realizes a bright display. Drawing 379 shows the example. In Drawing 379, in order to explain easily, the sealing film 73 is omitted.

[0153]In Drawing 379, 3791 is a light reflector. The light reflector 3791 is formed on the sealing film 73. The light reflector should just be a reflective means and may stick what vapor-deposited the metal thin film (Ag, aluminum) on the transparent sheet besides the metal thin films (Ag, aluminum, etc.) directly formed on the sealing film 73. A light reflector is not limited to a sheet shaped, film state, and filminess and tabular any. It is not necessary to have a function to reflect. For example, it is a dispersing agent. The resin board or opal glass containing diffusion particles which carried out frothed processing, such as a glass plate and titanium oxide, corresponds to a board or a sheet besides the diffusion sheet explained previously. Of course, diffusion particles, such as titanium oxide, may be applied and formed. In addition, it may be a light absorption film. It is because it is what this invention condenses the light emitted from the hole 3792, and is emitted as an existing directive light. Therefore, the hole 3792 may be formed in a light absorption film. Here, in order to explain easily, 3791 explains as a light reflector.

[0154]In Drawing 379, the hole 3792 (optical outgoing radiation hole) is arranged in the center section of the micro lens (optical curving means) 2802c (formation). The reflective barrier 3793 is formed between the pixels 16 which adjoined. This is formed with metallic materials or these alloys, such as AL, Mg, and Ag. In addition, it does not limit to a reflective barrier and what is necessary is just to have a shielding function. This is a broad sense and may have an optical absorption function.

[0155]Many things which function as a light absorption film or a light-shielding film exist with material. What is necessary is for a coloring matter to color an acrylic or an epoxy resin, and just to form. As a coloring matter, what distributed coloring matter or paints in resin may be used, and gelatin and casein may be dyed by acid dye like a light filter. Fluoran system coloring matter can

be made to be able to color and can also be used. A natural resin can be dyed using coloring matter. The material which distributed coloring matter in the synthetic resin can be used. Two or more kinds of combination may be sufficient as the range of selection of coloring matter in [those] one suitable sort from azo dye, anthraquinone dye, phthalocyanine dye, a triphenylmethane color, etc.

[0156]When forming the main component material of the reflective barrier 3793 by resin, it is preferred to use a polymeric material. As polymer, photo-curing type resin is used from the ease of a manufacturing process, and the point of chemical stability. The acrylic monomer which ultraviolet curing nature acrylic resin is illustrated as a concrete example, and carries out polymerization curing especially by UV irradiation, and the thing containing acrylic oligomer are preferred. The photoresist acrylic resin which has a fluorine group especially has little aging, and its lightfastness is also good.

[0157]The diffusion sheet 3751 etc. are arranged (formation) and the brightness unevenness by the micro lens 2802c or moire is kept from occurring in the optical outgoing radiation side of the optical curving means (micro lens etc.) 2802c.

[0158]When the micro lens 2802c is seen from a perpendicular direction so that it may illustrate to Drawing 380, it is formed so that the hole 3792 of the light reflector 3791 may be arranged near the focus of the lens 2802c. As for a hole, it is preferred to arrange in a position shorter than the focus of the micro lens 2802c. For example, if the focal distance of the micro lens 2802c is f (m), it is an optical emitting position (when the light reflector 3791 has thickness) of the hole 3792. As for the furthest position from the optical emitting position of the lens 2802c, it is preferred to make it become or more 0.5 0.95 or less position of the micro-lens 2802c focal position f. That is, a position shall be 0.5f or more 0.95f or less. The diameter of the hole 3792 is made or less [of micro-lens 2802c formed pitch d / 0.05 or more] into 0.5. That is, the diameter of a hole shall be 0.05d or more 0.5d or less.

[0159]In Drawing 380, the lens 2802c is illustrated so that circularly, but it may not be limited to this, and may be formed in hexagon shape in the shape of minute restoration (arrangement). Triangular shape may be sufficient. In addition, it may be boiled fish paste-like (the shape of two dimensions). It forms so that the hole 3792 may be located in the center section of the micro lens 2802c (Elements of the Invention), but it may not limit to this, and the hole position may shift. By shifting hole 3792 position from a center section, an angle can be given to the chief ray of the light emitted from the lens 2802c (it can carry out in the direction in which a chief ray was not perpendicular to and had a specific angle). Of course, it cannot be overemphasized that it is not necessary to form so that two or more lenses 2802c may be exactly restored to the pixel 16. In Drawing 382, it illustrates as the lens 2802c is directly formed on the light reflector 3791, but it may not limit to this, and a suitable isolation layer may be formed or arranged.

[0160]As for the EL display panel of Drawing 379, the picture element electrode 48 is a reflector. Scattered reflection of the light which emitted light by EL layer 47 is carried out with the light reflector 3791, the picture element electrode 48, and the reflective barrier 3793 so that it may illustrate to Drawing 381. Before long, a part of lights are emitted from the hole 3792, and are condensed with the lens 2802c. For example, the light 2791a enters into the hole 3792a directly from EL layer 47, and is condensed with the lens 2802c. After reflecting with the light reflector 3791 and then reflecting with the picture element electrode 48, the light 2791b enters into the hole 3792b, and is condensed with the lens 2802c. After reflecting with the reflective barrier 3793, the light 2791c enters into the hole 3792c, and is condensed with the lens 2802c.

[0161]Anyway, the light emitted from the detailed hole 3792 is condensed with a lens by the existing directive light. This is because it is the composition of point-light-source-izing EL layer 47 which is the surface light source with the reflection film 3791, and demonstrating a function with the lens 2802c. If it is the point light source, the lens 2802c can perform good condensing. The point light source part (hole 3792) serves as the high-intensity point light source, in order that light may concentrate. Therefore, efficiency for light utilization is also high. Therefore, the EL display of this invention can realize a bright display.

[0162]In order to raise the optical condensing efficiency by the micro lens 2802c, it is good to form the light scattering part 3821 on the reflector 48 etc. so that it may illustrate to Drawing 382 (Elements of the Invention). The light scattering part 3821 is realizable by making the surface of the reflector 48 become cloudy, forming minute unevenness, or applying or forming titanium oxide particles. The light scattering part 3821 can also realize a diffusion sheet and optical diffusion adhesives.

[0163]As illustrated in Drawing 382, the incident light 2791a turns into the scattered light 2791b in the light scattering part 3821 by forming the light scattering part 3821 in the lower layer of the hole 3792. The light of this scattered light 2791b enters into the hole 3792, and is condensed with the lens 2802c. By shifting the formation position of this light scattering part 3821 from just under the hole 3792, the angle of the chief ray of the light which enters into the lens 2802c can be leaned. Therefore, it can become the brightest display when a display panel is seen from a specific direction (it means not being perpendicular). When a display panel is seen from a specific direction also by the ability to shift [constituting so that the lens sheet 2802c and the light reflector 3791 can be separated, and] the hole 3792 and a lens 2802c center, It can become the brightest display (it is got blocked and the position which looks the brightest is changed).

[0164]In Drawing 381, Drawing 382, etc., two dimensions-like may be sufficient as the micro lens 2802c so that it may illustrate to Drawing 383. Also in Drawing 383, the minor axis of the hole 3792 uses 0.5 or less [of micro-lens 2802c formed pitch d / 0.05 or more]. That is, the width of a hole shall be 0.05d or more 0.5d or less. In Drawing 380, as 1 pixel of nine lenses 2802c had been arranged 16, it illustrated. However, when it comprises the pixel 16 (16R, 16G, 16B) of longwise RGB so that it may illustrate to Drawing 384, it cannot be overemphasized that it may constitute so that the micro lens 2802c of the same number may be arranged at each pixel (formation).

[0165]Since the light to generate is random light, an EL display panel has the feature that an angle of visibility is large. However, since the light generated conversely is random light, there is also much light which carries out total internal reflection by a substrate interface. It is said that the light which carries out total internal reflection to a report is 2/3 of all the generation light. Scattered reflection (halation) of this total-internal-reflection light is carried out with a substrate (the array substrate 49, the closure lid 41) etc., and it reduces display contrast.

[0166]It generates from EL layer 47, and if the light which returns to EL layer 47 again is controlled, halation can be prevented and a high contrast display can be realized. This invention persons have realized the high contrast display by constituting so that the following conditions may be satisfied (formation), as a result of repeating and considering various experiments. Hereafter, this condition is explained.

[0167]First, effective diagonal length of a display panel is set to d (m) so that it may illustrate to Drawing 386. Distance to the interface to which the substrate 49 touches air from EL layer 47 is set to t (m) so that it may illustrate to Drawing 385. The refractive index of the substrate 49 is set to n. At this time, it is t >= -(1/8) root (n-n-1).
****** is satisfied. From that of satisfying the conditions not more than this, there is no halation and a high contrast display can be realized.
[0168]Preferably, from that of satisfying the following conditions, there is no halation further and a high contrast display can be realized.
[0169]t >= -(1/4) root (n-n-1)
A light absorption film is formed in invalid zones of the substrate 49, such as the field through which a light effective in image display does not pass, for example, the side of the substrate 49, etc. A light absorption film absorbs the light reflected by the interface with the air of the substrate 49, and controls that halation occurs within the substrate 49.
[0170]Thickness t of the substrate 49 is not limited to being set to thickness t with one substrate. For example, it cannot be overemphasized that optical coupling (optical coupling layer 3871) of two sheets or the substrate beyond it is pasted together or carried out, and it may be made to satisfy substrate thickness t.
[0171]The above is a case where the substrate 49 is tabular. the thickness of the display panel as the whole can be reduced by what the concave lens 3872 is attached to the optical EL display panel's 82 outgoing radiation side for in the optical coupling layer 3871 (optical coupling materials (**)) as shown in Drawing 387 (it sticks -- optical coupling is carried out -- optical coupling is carried out). That is, it is because the concave lens 3872 has returning [little] the light reflected by an interface with air to an effective display area. When the emission face of the outgoing radiation side board 49 is a concave surface, this means that the effect of contrast improvement is large as compared with the case where an emission face is a flat surface, even if main thickness is thin. Therefore, it is not restrained by t >= -(1/4) root (n-n-1).
[0172]Distortion is lost to a display image by arranging the minute air layer (air gap) 3875 to the concave lens 3872, and arranging the positive lens (planoconvex lens) 3873 so that it may illustrate to Drawing 387 (b). The periphery is closed with the encapsulant (sealing agent) 3874 so that dust etc. may not invade into an air gap.
[0173]A vacuum evaporator uses the device which converted the commercial high vacuum evaporation apparatus (the Japan vacuum-technology incorporated company make, EBV-6DA type). the main exhaust is a turbo-molecular pump (Makoto Osaka fictitious stock type company make, TC1500) of 1500 l. of exhaust speeds / min -- a ultimate vacuum -- about 1 -- it is less than x10e-6Torr, and all the vacuum evaporation is performed in the range of 2 - 3x10e-6Torr. All the vacuum evaporation is good to carry out by connecting DC power supply (Kikusui electronic incorporated company make, PAK10-70A) to the resistance heating type deposition boat made from tungsten.
[0174]Thus, on the array substrate arranged in a vacuum layer, 20-50 nm of carbon films are formed. Next, a 4-(N,N-bis(p-methylphenyl)amino)-alpha-phenylstilbene is formed in about 5 nm of thickness with the evaporation rate of 0.3nm/sec as a hole injection layer.
[0175]As an electron hole transporting bed, N,N'-bis(4'-diphenylamino 4-biphenylyl)-N,N'-diphenylbenzidine (made by Hodogaya chemicals incorporated company), Vapor codeposition of the 4-N,N-diphenylamino alpha-phenylstilbene was carried out with the evaporation rate of 0.3 nm/s and 0.01 nm/s, respectively, and it was formed in about 80 nm of thickness. tris(8-quinolinolato) aluminum (said -- Renhua -- study incorporated company make) is formed in about 40 nm of thickness with the evaporation rate of 0.3nm/sec as a luminous layer (electron transport layer).
[0176]Next, as an electron injection electrode, only Li is formed in about 1 nm of thickness with the evaporation rate of about 0.1nm/sec at low temperature from an AlLi alloy (high grade chemicals incorporated company make, aluminum/Li weight ratios 99/1), then temperature up of the AlLi alloy is carried out further. From the state in which Li was all out, only aluminum was formed in about 100 nm of thickness with the evaporation rate of about 1.5 nm/s, and was used as the electron injection electrode of a lamination type.
[0177]Thus, the created organic thin film EL element, After leaking the inside of a vacuum evaporation tub with dry nitrogen, under a dry nitrogen atmosphere, the Corning 7059 glass closure lid 41 was stuck with the seal adhesives (sealing compound) 45 (the Anelva CORP. make, trade name super back seal 953-7000), and it was considered as the display panel. The drier 55 is arranged in the space of the closure lid 41 and the array substrate 49. It is because an organic electroluminescence film is weak to humidity as for this. The moisture which permeates the sealing compound 45 with the drier 55 is absorbed, and degradation of the organic electroluminescence film 47 is prevented.
[0178]In order to control osmosis of the moisture from the sealing compound 45, it is a good measure to lengthen the course (path) from the outside. For this reason, the detailed unevenness 43 and 44 is formed in the periphery of a viewing area in the display panel of this invention. The heights 44 formed in the periphery of the array substrate 49 are formed doubly at least. As for the interval (formed pitch) of a convex and a convex, it is preferred to form in not less than 100 micrometers 500 micrometers or less, and the height of a convex has preferred not less than 30-micrometer thing set to 300 micrometers or less. These heights are formed with the La Stampa art. This La Stampa art applies the method which OMRON Corp. has adopted as the method of micro-lens formation, the method which Matsushita Electric uses as a formation method of a microlens with the pickup lens of CD, etc.
[0179]On the other hand, the heights 43 are formed also in the closure lid 41. The formed pitch of the heights 43 is made the same as that of the formed pitch of the heights 44. Thus, the heights 44 fit into the heights 43 exactly by making the same a formed pitch with the heights 43 and 44. Therefore, the position gap with the closure lid 41 and the array substrate 49 does not occur at the time of manufacture of a display panel. The sealing compound 45 is arranged between the heights 43 and 44. The sealing compound 45 prevents permeation of the moisture from the outside while pasting up the closure lid 41 and the array substrate 49.
[0180]It is preferred to use what consists of acrylic resin with UV (ultraviolet rays) hardening type as the sealing compound 45. As for an acrylic resin, it is preferred to use what has a fluorine group. In addition, the adhesives or the binder of an epoxy system may be used. As for the refractive index of adhesives or a binder, it is preferred to use or more 1.47 1.54 or less thing. As for especially seal adhesives, it is preferred to add impalpable powder, such as impalpable powder of titanium oxide and silicon oxide, at a rate of 95% or less not less than 65% by a weight ratio. As for the particle diameter of this impalpable powder, it is

preferred to consider it as the not less than 20-micrometer average diameter of 100 micrometers or less. The effect which controls penetration of the humidity from the forge-fire outside where the weight ratio of impalpable powder increases becomes high. However, if too large, air bubbles etc. will enter easily, space will become large on the contrary, and a sealing effect will fall.
[0181]As for the weight of a drier, it is preferred to carry out 0.04g or more per 10 mm in length of seal 0.2g or less. It is desirable to carry out 0.06g or more per 10 mm in length of seal 0.15g or less especially. the quantity of a drier becomes empty -- shortly after there is too nothing, there are few moisture preventive effects and an organic electroluminescence layer deteriorates. If too large, when a drier will carry out a seal, it becomes an obstacle, and a good seal cannot be performed.
[0182]Although it is the composition closed using the lid 41 of glass in drawing 4, it may be closure using a film like drawing 7. For example, using for the film of an electrolytic condenser what vapor-deposited DLC (diamond- -like carbon) as a sealing film is illustrated. This film has very bad moisture perviousness (moisture proof). This film is carried out sealing film 74, and it uses. It cannot be overemphasized that the composition thing which vapor-deposits a DLC film etc. directly on the surface of the electrode 72 is good. That is, it closes with a thin film. The thickness of a thin film is n-d (n calculates those refractive indicees by making them synthesis (n-d of each thin film is calculated), when the refractive index of a thin film and two or more thin films are laminated.). d synthesizes and calculates those refractive indicees, when the thickness of a thin film and two or more thin films are laminated. It is good to make it below the luminescence dominant wavelength lambda of EL element 15 become. By satisfying this condition, the optical extraction efficiency from EL element 15 more than doubles as compared with the case where it closes with a glass substrate. The alloy, the mixture, or laminated material of aluminum and silver may be formed.
[0183]Not using the lid 41, the composition closed with the sealing film 74 is called thin film closure as mentioned above. The thin film closure in lower extraction which takes out light from the substrate 49 side forms the aluminum electrode used as a cathode on EL film after forming EL film. Next, the resin layer as a buffer layer is formed on this aluminum film. Organic materials, such as an acrylic and epoxy, are illustrated as a buffer layer. 1-micrometer or more a thickness of 10 micrometers or less is [thickness] suitable. Not less than 2-micrometer a thickness of 6 micrometers or less is [thickness] suitable still more preferably. The sealing film 74 on this buffer film is formed. If there is no buffer film, the structure of EL film will collapse with stress and a defect will occur in the shape of a muscle. As the sealing film 74 was mentioned above, the layer system (structure which carried out multilayer vacuum evaporation of dielectric membrane and the aluminum thin film by turns) of DLC (diamond- -like carbon) or an electric field capacitor is illustrated.
[0184]The thin film closure in upper extraction which takes out light from the EL layer side forms the Ag-Mg film used as a cathode by 20-A or more 300-A thickness on EL film after forming EL film. Moreover transparent electrodes, such as ITO, are formed and it low-resistance-izes. Next, the resin layer as a buffer layer is formed on this electrode layer. The sealing film 74 is formed on this buffer film.
[0185]It is reflected with the reflection film 46, and the half of the light generated from the organic electroluminescence layer 47 is penetrated with the array substrate 49, and is emitted. However, outdoor daylight is reflected, a reflect lump occurs and the reflection film 46 reduces display contrast. For this measure, the lambda/4 board 50 and the polarizing plate 54 are arranged to the array substrate 49. When a pixel is a reflector, the light generated from EL layer 47 is emitted upward. Therefore, it cannot be overemphasized that the phase plate 50 and the polarizing plate 54 are arranged to the optical outgoing radiation side. A reflection type pixel is obtained by constituting the picture element electrode 48 from aluminum, chromium, silver, etc. An interface with an organic electroluminescence layer becomes large by providing heights (or uneven part) in the surface of the picture element electrode 48, and an emission area becomes large, and luminous efficiency improves. When the reflection film used as a cathode (anode) is formed in a transparent electrode or reflectance can be reduced to 30% or less, the circular light board is unnecessary. It is because a reflect lump decreases substantially. Interference of light is also reduced and it is desirable.
[0186]The contrast of an organic electroluminescence display panel can be improved by negating the outdoor daylight reflection realized by forming a two-layer thin film in the inside of a display by optical interference. Cost can be reduced compared with the case where the conventional circular light board is used. The problem of the diffuse reflection which the circular light board was holding, and the problem of the view angle dependence of a foreground color and the thickness dependency of an organic electroluminescence luminous layer are solvable.
[0187]Between the substrate 49 and the polarizing plate (polarization film) 54, one sheet or two or more phase films (a phase plate, a phase rotating means, a phase difference plate, a phase difference film) are arranged. It is preferred to use polycarbonate as a phase film. A phase film makes emitted light generate phase contrast for incident light, and contributes to performing light modulation efficiently.
[0188]In addition, an organic resin board or organic resin films, such as polyester resin, PVA resin, polysulphone resin, vinylchloride resin, ZEONEX resin, an acrylic resin, and polystyrene resin, etc. may be used as a phase film. In addition, the crystal of crystal etc. may be used. The phase contrast of one phase plate has preferred not less than 50-nm thing set to 350 nm or less to 1 shaft orientations, and not less than 80 more nm the thing set to 220 nm or less is preferred.
[0189]It cannot be overemphasized that the circular light board 74 (circular light film) which unified the phase film and the polarizing plate so that it might illustrate to drawing 7 may be used.
[0190]As for the phase film 50, it is preferred for a color or paints to color and to give the function as a filter. The red (R) purity of especially organic electroluminescence is bad. Therefore, the fixed wavelength range is omitted with the colored phase film 50, and a color temperature is adjusted. As for a light filter, it is common to be provided by pigment dispersion type resin as a dyeing filter. Paints absorb the light of a specific wavelength band region, and penetrate the light of the wavelength band region which was not absorbed.
[0191]A part or the whole of a phase film may be colored as mentioned above, or a diffusing function may be given to the whole in part. Embossing of the surface may be carried out or an antireflection film may be formed for acid resisting. It is preferred to form a light-shielding film or a light absorption film in a part without the part or trouble which is not effective in image display, and to tighten the black level of a display image, or to demonstrate the contrast improvement effect by antihalation. A micro lens may be formed in the shape of boiled fish paste, or matrix form by forming unevenness in the surface of a phase film. A micro lens is arranged so that it may correspond to one picture element electrode or a trichromatic pixel, respectively.
[0192]Although described also in advance, the function of a phase film may be given to a light filter. For example, phase contrast

can be generated, when rolling at the time of formation of a light filter or making it phase contrast arise in the fixed direction by photopolymerization. In addition, phase contrast may be given by carrying out photopolymerization of the smoothing film 71 of drawing 7. If constituted in this way, it becomes unnecessary not to constitute a phase film or to arrange it out of a substrate, the composition of a display panel becomes simple, and low cost-ization can be desired. It cannot be overemphasized that the above matter may be applied to a polarizing plate.

[0193]As a main material which constitutes the polarizing plate (polarization film) 54, a TAC film (triacetyl cellulose film) is the optimal. A TAC film is because it has the outstanding optical property, surface smoothness, and processing suitability. About manufacture of a TAC film, it is optimal to produce with solution flow casting film production art.

[0194]The thing of the resin film in which the polarizing plate added iodine etc. to poly vinyl alcohol (PVA) resin is illustrated. Since the polarizing plate of the polarization separating means of a couple performs polarized light separation by absorbing the polarization component of the specific direction of a polarization axis, and a different direction among incident light, its utilization efficiency of light is comparatively bad. Then, the reflecting polarizer which performs polarized light separation may be used by reflecting the polarization component (reflective polarizer: reflective polarizer) of the specific direction of a polarization axis, and a different direction among incident light. If constituted in this way, the utilization efficiency of light will increase with a reflecting polarizer, and a display brighter than the above-mentioned example using a polarizing plate will be attained.

[0195]Besides such a polarizing plate or a reflecting polarizer, as a polarization separating means of this invention, For example, it is also possible to use what combined the cholesteric liquid crystal layer and lambda (1/4) board, the thing divided into reflective polarization and transmitted polarized light using Brewster's angle, the thing using a hologram, a polarization beam splitter (PBS), etc.

[0196]The AIR coat is given to the surface of the polarizing plate 54 although not illustrated in drawing 4. The composition which forms an AIR coat with dielectric monolayer or a multilayer film is illustrated. In addition, resin of the low refractive index of 1.35-1.45 may be applied. For example, the acrylic resin of a fluorine system, etc. are illustrated. Especially the characteristic has [a refractive index] good or more 1.37 1.42 or less thing.

[0197]An AIR coat has the composition of three layers, or two-layer composition. In the case of three layers, it is used in order to prevent reflection in the wavelength band region of large visible light, and it calls this a multi-coat. In a two-layer case, it is used in order to prevent reflection in the wavelength band region of specific visible light, and it calls this V coat. A multi-coat and V coat are properly used according to the use of a display panel. Not the thing to limit more than two-layer but one layer may be sufficient.

[0198]In the case of a multi-coat, optical thickness laminates nd1=lambda/2, and magnesium fluoride (MgF2) nd1=lambda/4, and forms an aluminum oxide (aluminum2O3) for nd=lambda/4, and a zirconium (ZrO2). Usually, a thin film is formed as a value of 520 nm or the neighborhood of those as lambda. In the case of V coat, nd1=lambda/4 or yttrium oxide (Y2O3), and magnesium fluoride (MgF2) are laminated n d1=lambda/4, and it forms silicon monoxide (SiO) for optical thickness nd1=lambda/4, and magnesium fluoride (MgF2). It is better to use Y2O3, when modulating blue glow, since SiO has an absorption band region in the blue side. Since the direction of Y2O3 is stable also from the stability of a substance, it is desirable. SiO2 thin film may be used. Of course, it is good also as an AIR coat using resin of a low refractive index, etc. For example, acrylic resins, such as fluoride, are illustrated. As for these, it is preferred to use an ultraviolet curing type.

[0199]In order to prevent static electricity from being charged by the display panel, it is preferred to apply resin of hydrophilic nature to the surfaces, such as a display panel. In addition, in order to prevent surface reflection, embossing may be performed on the surface of the polarizing plate 54, etc.

[0200]Although TFT is connected to the picture element electrode 48, it is not limited to this. With an active matrix, as a switching element, a thin film transistor (TFT) etc. It cannot be overemphasized that a diode method (TFD), a barista, a thyristor, ring-die oared, HOTODA oared, a photo transistor, FET, a MOS transistor, a PLZT element, etc. may be sufficient. That is, the switch element 11, the driver element 11, and the thing to constitute can use these either.

[0201]As for TFT, it is preferred to adopt LDD (low doping drain) structure. All the general element which carry out transistor operation of switching, such as FET, etc. is meant in TFT. It cannot be overemphasized that the composition of EL film, panel structure, etc. are applicable also to a simple matrix type display panel. It cannot be overemphasized that it does not limit to this although an example raises the organic EL device (OEL, PEL, PLED, OLED) 15 with this specification and it explains it as an EL element, and it is applied also to an inorganic EL element.

[0202]First, the active matrix system used for an organic electroluminescence display panel should choose the pixel of 1. specification, and gives required display information. Two conditions that current can be sent through an EL element through 2 and 1 frame period must be satisfied.

[0203]In order to satisfy these two conditions, in the element composition of the conventional organic electroluminescence shown in drawing 12, the transistor for switching for 1st TFT11a to choose a pixel and 2nd TFT11b are taken as the transistor for a drive for supplying current to EL element (EL film) 15.

[0204]Although the transistor 11a for switching is required for liquid crystals as compared with the active matrix system used for a liquid crystal here, the transistor 11b for a drive is required in order to make EL element 15 turn on. Although this reason can hold an ON state by impressing voltage in the case of a liquid crystal, it is because the lighted condition of the pixel 16 cannot be maintained if it does not continue sending current when it is EL element 15.

[0205]Therefore, in order to continue sending current, making the transistor 11b one [an EL display panel] must be continued. First, if both a scanning line and the data line are turned on, an electric charge will be accumulated in the capacitor 19 through the transistor 11a for switching. The one [current continues flowing from the current supply source line 20, and / the pixel 16] over 1 frame period in order that this capacitor 19 may continue applying voltage to the gate of the transistor 11b for a drive, even if the transistor 11a for switching is come by off.

[0206]When displaying gradation using this composition, it is necessary to impress the voltage according to gradation as gate voltage of the transistor 11b for a drive. Therefore, dispersion in the ON state current of the transistor 11b for a drive appears in a display as it is.

[0207]If the ON state current of a transistor is the transistor formed with the single crystal, it is very uniform, but. In low-temperature polycrystal galvanized iron JISUTA which the forming temperature which can be formed in a cheap glass substrate

formed with the low-temperature polysilicon art of 450 degrees or less. Since dispersion in the threshold has dispersion in the range which is **0.2V-0.5V, the ON state current which flows through the transistor 11b for a drive varies corresponding to this, and nonuniformity occurs in a display. Such nonuniformity generates not only dispersion in threshold voltage but the mobility of TFT and the thickness of gate dielectric film. The characteristic changes also with degradation of TFT11.

[0208]Therefore, in order to obtain a uniform display, it is necessary to control the characteristic of a device by the method of displaying gradation in analog, strictly, and cannot be satisfied with it of the spec. which is less than a prescribed range about this variation of stopping, in the present low-temperature polycrystal poly-Si TFT. Since this problem is solved, four transistors are provided in 1 pixel and how to make dispersion in threshold voltage compensate by a capacitor, and to acquire uniform current, the method of forming a current regulator circuit for every pixel, and attaining equalization of current, etc. can be considered.

[0209]However, since the current by which these methods are programmed is programmed through EL element 15, when a current route changes, the transistor which controls driving current to the switching transistor connected to a power source line serves as a source follower, and a drive margin becomes narrow. Therefore, it has the technical problem that driver voltage becomes high.

[0210]It is necessary to use the switching transistor linked to a power supply in the field where impedance is low, and the technical problem that it is influenced by the characteristic fluctuation of EL element 15 also has this working range. moreover, when kink current occurs in the volt ampere characteristic in a saturation region and change of the threshold voltage of a transistor occurs in it, if the memorized current value is changed to it, it will obtain to it, and a technical problem is also in it.

[0211]Even if the transistor 11 which controls the current which flows into EL element 15 does not serve as source follower composition to an aforementioned problem and the EL element structure of this invention has kink current in the transistor, It is the composition which can make small change of the current value which can suppress the influence of kink current to the minimum, and is memorized.

[0212]The EL element structure of this invention is specifically formed of two or more transistors 11 and EL elements which a unit pixel becomes from at least four as shown in drawing 1 (a). A picture element electrode is constituted so that it may lap with a source signal line. That is, the flattening film which consists of an insulator layer or acrylic material is formed on the source signal line 18, it insulates, and a picture element electrode is formed on this insulator layer. Thus, the composition which piles up a picture element electrode is called a high aperture (HA) structure on the source signal line 18.

[0213]It lets the 1st transistor (TFT or switching element) 11a and 3rd transistor (TFT or switching element) 11c pass for the 1st gate signal line (the 1st scanning line) 17a being active (ON voltage is impressed) and by carrying out, the current value which should be passed to said EL element 15 is passed, and between the gate of the 1st transistor and a drain is short-circuited -- as -- the 2nd transistor 11b -- the 1st gate signal line 17a -- it opening being active (ON voltage is impressed) and by becoming, and. It is remembered that the gate voltage (or drain voltage) of the 1st transistor 11a passes said current value to the capacitor (a capacitor, storage capacitance) 19 connected between the gate of the 1st transistor 11a, and sauce.

[0214]As for the sauce inter gate capacity (capacitor) 19 of the 1st transistor 11a, it is preferred to consider it as the capacity of 0.2 pF or more. As other composition, the composition which forms the capacitor 19 is also illustrated separately. That is, it is the composition which forms storage capacitance from a capacitor electrode layer, gate dielectric film, and a gate metal. It is more desirable to constitute a capacitor from the viewpoint which prevents the brightness lowering by leak of the M3 transistor 11c, and a viewpoint for stabilizing a display action separately in this way. The size of the capacitor (storage capacitance) 19 has good 0.2-pF or more thing set to 2 pF or less, and the size of the capacitor (storage capacitance) 19 has especially good 0.4-pF or more thing set to 1.2 pF or less.

[0215]what the capacitor 19 is formed in general in the non display regions between the adjoining pixels for -- this -- better -- **. Generally, when creating full color organic electroluminescence, in order to form an organic electroluminescence layer by the mask deposition by a metal mask, the formation position of the EL layer by mask position gap occurs. When a position gap occurs, there is a danger that the organic electroluminescence layer of each color will lap. Therefore, not less than 10micro of non display regions between the pixels which each color adjoins must be left. This portion turns into a portion which does not contribute to luminescence. Therefore, it becomes an effective means for the improvement in a numerical aperture to form the storage capacitance 19 in this field.

[0216]The metal mask 2881 is produced with a magnetic body, and adsorbs the metal mask 2881 magnetically with a magnet from the rear face of the substrate 49. By magnetism, the metal mask 2881 is stuck without a substrate and a crevice. The matter about the above manufacturing method is applied to other manufacturing methods of this invention.

[0217]Next, the 2nd gate signal line 17b is activated, using the 1st gate signal line 17a as inactive (OFF voltage is impressed), It operates so that it may change to the course containing the 4th transistor 11d by which the course into which current flows was connected to said 1st transistor 11a and EL element 15, and said EL element 15 and the memorized current may be sent through said EL element 15.

[0218]This circuit has the four transistors 11 in 1 pixel, and the gate of the 1st transistor M1 is connected to the sauce of the 2nd transistor M2, The gate of the 2nd transistor and the 3rd transistor M2 is connected to the 1st gate signal line 17a, the drain of M2 is connected to the sauce of M3, and the sauce of the 4th transistor M4, and the drain of M3 is connected to the source signal line 18. The gate of the transistor M4 is connected to the 2nd gate signal line 17b, and the drain of the transistor M4 is connected to the anode electrode of EL element 15.

[0219]P channel constitutes all the TFTF(s) from drawing 1. Although P channel has somewhat low mobility as compared with TFT of N channel, since pressure-proofing does not generate degradation easily greatly again, either, it is desirable. However, it does not limit only to this invention constituting EL element composition from a P channel. It may constitute only from an N channel (see drawing 42, drawing 43, drawing 67, etc.). It may constitute using both N channel and P channel.

[0220]The 3rd and 4th transistors are constituted from same polarity, and it constitutes from an N channel, and, as for the 1st and 2nd transistors, constituting from a P channel is preferred. Generally P channel transistor has a large effect which uses the 1st transistor 11a as P channel to the EL element which obtains the target luminescence intensity by there being the features, like reliable there is little kink current, and controlling current as compared with N channel transistor.

[0221]Hereafter, the EL element composition of this invention is explained using drawing 13. The EL element composition of this

invention is controlled by two timing. The 1st timing is timing which makes a required current value memorize. When TFT11b and TFT11c turn on to this timing, it becomes drawing 13 (a) as an equivalent circuit. Here, the predetermined current I1 is written in from a signal wire. Thereby, TFT11a will be in the state where the gate and the drain were connected, and the current I1 will flow through it through this TFT11a and TFT11c. Therefore, the voltage of the gate sauce of TFT11a turns into the voltage V1 that I1 flows.

[0222]TFT11a and TFT11c close the 2nd timing, it is the timing which TFT11d opens and the equivalent circuit at that time serves as drawing 13 (b). The voltage V1 between the sauce gates of TFT11a becomes [being held with as, and]. In this case, the transistor 11a of M1 becomes constant [the current of I1] in order to always operate in a saturation region.

[0223]The gate of the transistor 11a and the gate of the transistor 11c are connected to the same gate signal line 11a. However, the gate of the transistor 11a and the gate of the transistor 11c may be connected to the different gate signal line 11 (it enables it to control SA1 and SA2 individually). That is, a 1-pixel gate signal line becomes three (the composition of drawing 1 is two). By controlling individually the ON/OFF timing of the gate of the transistor 11a, and the ON/OFF timing of the gate of the transistor 11c, the current value variation of EL element 15 by dispersion in the transistor 11 can be reduced further.

[0224]The 1st gate signal line 17a and 2nd gate signal line 17b are carried out in common, and if it is the conductivity type (N channel and P channel) which differed in the 3rd and 4th transistors, simplification of a drive circuit and the numerical aperture of a pixel can be raised.

[0225]If constituted in this way, as operation timing of this invention, the write-in course from a signal wire will be come by off. That is, when predetermined current is memorized, if the course into which current flows has branching, an exact current value will not be memorized by the sauce inter gate capacity (capacitor) of M1. By using TFTM3 and TFTM4 as different conducted type of current, after M3 certainly turns off to the timing from which a scanning line changes by controlling a mutual threshold, it enables M4 one.

[0226]However, since it is necessary to control a mutual threshold correctly in this case, cautions of a process are required. Although the circuit described above is realizable with at least four transistors, Even if cascade connection of the transistor 11e (M5) is carried out for Miller-effect reduction as shown in drawing 1 (b) and the total of a transistor becomes four or more so that more exact timing may control or mention later, the principle of operation is the same. Thus, by having composition which added the transistor 11e, the current programmed via the transistor M3 can pass now with more sufficient accuracy to EL element 15.

[0227]In the composition of drawing 1, it is still more preferred that the current value Ids in the saturation region of the 1st transistor 11a satisfies the conditions of a lower type. In a lower type, the value of lambda satisfies or less 0.06 0.01 or more conditions between the adjoining pixels.

[0228]

$Ids=k*(Vgs-Vth)^2 (1+ Vds*lambda)$

In this invention, although the working range of the transistor 11a is limited to a saturation region, it separates from the transistor characteristics in a saturation region from the ideal characteristic, and they are generally influenced by the voltage between sauce drains. This effect is called Miller effect.

[0229]The case where the shift of the threshold as for which deltaVt becomes each transistor 11a in the adjoining pixel occurs is considered. In this case, the current value memorized is the same. If the shift of a threshold is set to deltaL, abbreviation delta Vxlambda is equivalent to a gap of the current value of EL element 15 by changing the threshold of the transistor 11a. Therefore, it turns out that lambda must be below 0.01xx/y noting that y(V) is permitted between the pixels which adjoin the permissible dose of a shift of a threshold, in order to suppress a gap of current below to x (%).

[0230]This acceptable value changes with the luminosity of application. If the amount of change has not less than 2% of luminosity in the brightness area from 100-cd[/m]^2 to 1000-cd[/m]^2, human being will recognize the changed boundary line. Therefore, it is required for the amount of change of luminosity (current amount) to be less than 2%. When luminosity is higher than 100 cd/cm^2, the luminance variation of the adjoining pixel will be not less than 2%. When using EL display device of this invention as a display for personal digital assistants, the demand luminosity is a 100-cd[/m]^2 grade. When the pixel configuration of drawing 1 was actually made as an experiment and change of the threshold was measured, the adjoining pixel transistor 11a Set and it turned out that the maximum of change of a threshold is 0.3V. Therefore, in order to suppress change of luminosity within 2%, lambda must be 0.06 or less. However, it is not necessary to carry out to 0.01 or less. It is because human being cannot recognize change. In order to attain the variation in this threshold, it is necessary to enlarge transistor size enough, and it is unreal.

[0231]It is preferred to constitute so that the current value Ids in the saturation region of the 1st transistor 11a may satisfy a lower type. It may be 1% or more 5% or less between the pixels which change of lambda adjoins.

[0232]

$Ids=k*(Vgs-Vth)^2 (1+ Vds*lambda)$

If lambda of the above-mentioned formula has change even when change of a threshold does not exist even if between the adjoining pixels, the current value which flows through EL will be changed. In order to suppress change within **2%, change of lambda must be suppressed to **5%. However, it is not necessary however, to make it to 1% or less. It is because human being cannot recognize change. In order to attain 1% or less, it is necessary to enlarge transistor size fairly, and it is unreal.

[0233]According to an experiment, an array trial production, and examination, it is preferred that the channel length of the 1st transistor 11a sets to not less than 10 micrometers 200 micrometers or less. It is preferred that the channel length of the 1st transistor 11a sets to not less than 15 micrometers 150 micrometers or less still more preferably. This is considered to be because for an electric field to be eased and for a kink effect to be low suppressed, when the grain boundaries included in a channel increase in number when channel length L is lengthened.

[0234]The transistor 11 which constitutes a pixel is formed by the poly-Si TFT formed by the laser recrystallization method (laser annealing), and it is preferred that the direction of the channel in all the transistors is the same direction to the direction of radiation of laser.

[0235]Dispersion in transistor characteristics proposes the circuitry which does not affect a display, and four or more

transistors are [therefore] required for the purpose of an invention of this patent. If the characteristic of four transistors does not gather when these transistor characteristics determine a circuit constant, it is difficult to ask for a suitable circuit constant. To the major axis direction of laser radiation, by the case where the direction of a channel is level, and the case of being vertical, the threshold and mobility of transistor characteristics differ from each other, and are formed. The grade of dispersion is the same in both cases. Horizontally, if perpendicular, the average value of ****** of mobility and a threshold differs. Therefore, the more nearly same one of the direction of a channel of all the transistors which constitute a pixel is desirable.
[0236]When Cs and the OFF state current value of the 2nd transistor 11b are set to Ioff for the capacity value of the storage capacitance 19, it is preferred to satisfy a following formula.
[0237]3 It is preferred to satisfy a following formula to < Cs/Ioff < 24 pan preferably.
[0238]6 By setting the OFF state current of the < Cs/Ioff < 18 transistor 11b to 5 or less pA, it is possible to suppress change of the current value which flows through EL to 2% or less. This is because the electric charge stored between gate sauce (both ends of a capacitor) in the voltage non-writing state cannot be held between 1 fields, when leakage current increases. Therefore, if the capacity for accumulation of the capacitor 19 is large, the permissible dose of the OFF state current will also become large. Change of the current value between adjacent pixels can be suppressed to 2% or less by filling said formula.
[0239]It is preferred that the transistor which constitutes an active matrix is constituted by the p-ch polysilicon thin film transistor, and the transistor 11b considers it as the multi-gate structure which is more than a dual gate. In order that the transistor 11b may act as a switch between the sauce drains of the transistor 11a, the characteristic that an ON/OFF ratio is high as much as possible is required. The high characteristic of an ON/OFF ratio is realizable by making structure of the gate of the transistor 11b into the multi-gate structure beyond dual gate structure.
[0240]The transistor which constitutes an active matrix comprises a polysilicon thin film transistor, and it is preferred that below 54-micrometer^2 carries out (channel width W) * (channel length L). [of each transistor] (Channel width W) * (channel length L) and the variation of transistor characteristics have correlation. The cause of dispersion in transistor characteristics has a large thing resulting from dispersion in the energy by the exposure of laser, etc., therefore in order to absorb this, it is desirable. [of the structure which contains many exposure pitches (generally about ten micrometers) of laser by the inside of a channel as much as possible] By below 54-micrometer^2 carrying out (channel width W) * (channel length L), there is no dispersion resulting from laser radiation, and the thin film transistor to which the characteristic was equal can be obtained. [of each transistor] If transistor size becomes small too much, characteristic dispersion by area will occur. Therefore, it is made for (channel width W) * (channel length L) to become more than 9-micrometer^2. [of each transistor] As for (channel width W) * (channel length L), it is preferred to make it below 45-micrometer^2 become [more than 16 micrometer^2] still more preferably. [of each transistor]
[0241]Things are [making it mobility change of the 1st transistor 11a in the adjoining unit pixel be 20% or less] preferred. When mobility runs short, by the time the charging capacity of a switching transistor deteriorates and it passes a current value required for within a time, capacity between the gate sauce of M1 cannot be charged. Therefore, dispersion in the luminosity between pixels can be made below into ****** by suppressing dispersion in movement within 20%.
[0242]Although the pixel configuration explained the above explanation as composition of drawing 1, the above matter is applicable also to the composition illustrated to drawing 21, drawing 43, drawing 71, and drawing 22. Hereafter, composition, operation, etc. are explained about pixel configurations, such as drawing 21.
[0243]When setting up the current sent through EL element 15, voltage between gate sauce which produces the signal current sent through TFT11a in TFT11a as a result of [its] Iw is set to Vgs. Since between the gate drains of TFT11a has connected too hastily by TFT11d at the time of writing, the TFT11a operates in a saturation region. Therefore, Iw is given by the following formulas.
[0244]

Iw=mu 1, Cox1 and W1/L1/2 (Vgs-Vth1) ^{2} -- (1)

Here, Cox is the gate capacitance per unit area, and is given by Cox=epsilon 0 and epsilonr/d. The mobility of a career and W show channel width, L shows channel length, as for the threshold and mu which are TFT as for Vth, vacuous mobility and epsilonr show the specific inductive capacity of gate dielectric film, as for epsilon 0, and d is the thickness of gate dielectric film.

[0245]A current level will be controlled by TFT1b by which Idd is connected in series with EL element 15 if the current which flows into EL element 15 is set to Idd. In this invention, since the voltage between the gate sauce is in agreement with Vgs of (1) type, if it assumes that the TFT1b operates in a saturation region, the following formulas will be realized.
[0246]

Idrv=mu 2, Cox2 and W2/L2/2 (Vgs-Vth2) ^{2} -- (2)

Generally conditions for the insulated-gate electric field effect type thin film transistor (TFT) to operate in a saturation region are given by the following formulas by making Vds into the voltage between drain sauce.
[0247]

| Vds|>|Vgs-Vth| -- (3)

Here, since the inside of a small pixel is approached and it is formed, TFT11a and TFT11b are profile mu1=mu2 and Cox1=Cox2, and unless creativity in particular is put, they are considered to be Vth1=Vth2. Then, the following formulas are easily drawn from (1) type and (2) types at this time.
[0248]

Idrv/Iw=(W2/L2)/(W1/L1) -- (4)

Although it is common in (1) type and (2) types to vary for every pixel, every product, or every manufacture lot as for the value of mu, Cox, and Vth itself, the point which it should be careful of here, (4) Since a formula does not contain these parameters, I hear that it is not dependent on these dispersion, and there is a value of Idrv/Iw.
[0249]If it designs with W1=W2 and L1=L2, Idrv/Iw=1, i.e., Iw and Idrv, will become the same value. That is, since the driving current Idd which is not based on characteristic dispersion of TFT but flows into EL element 15 becomes the same as that of the signal current Iw correctly, it can control the light emitting luminance of EL element 15 correctly as a result.
[0250]since [as mentioned above,] Vth1 of TFT11a for conversion and Vth2 of TFT11b for a drive are fundamentally the same

-- both TFT(s) -- if the signal level of a cutoff level is impressed to the gate which is in the common electric potential of ** mutually -- TFT11a and TFT11b -- it must be in both non-switch-on -- it comes out. However, Vth2 may become low rather than Vth1 by factors, such as dispersion in a parameter, also within a pixel actually. At this time, since the leakage current of subthreshold level flows into TFT11b for a drive, EL element 15 presents fine luminescence. The contrast of a screen falls by this fine luminescence, and display properties are spoiled.

[0251]Especially in this invention, it has set up so that threshold voltage Vth2 of TFT11b for a drive may not become lower than threshold voltage Vth1 of TFT11a for conversion corresponding within a pixel. For example, even if gate length L2 of TFT11b is made longer than the gate length L1 of TFT11a and it changes the process parameter of these thin film transistors, Vth2 is kept from becoming lower than Vth1. It is possible for this to control very small current leakage. The above matter is applied also to TFT11a of drawing 1, and the relation of TFT11d.

[0252]Transistor TFT11for conversion a into which signal current flows as shown in drawing 21, Transistor TFT11for drive b etc. which control the driving current which flows into the light emitting device which consists of EL element 15 grade. Transistor TFT11for taking in c which connects or intercepts a pixel circuit and data-line data by control of the 1st scanning line scanA (SA), By control of the 2nd scanning line scanB (SB). It comprises the capacity C19 for after a write end to hold the voltage between gate sauce of transistor TFT11d for a switch and TFT11a which short-circuit the gate drain of TFT1111a during a write-in period, EL element 15 as a light emitting device, etc. Therefore, since gate signal lines are each two pixels, they can apply the composition of the whole specification of this invention explained by drawing 1, drawing 2, drawing 3, etc. which were explained above, a function, operation, etc.

[0253]Although TFT11c consists of drawing 21 and the transistor of N-channel MOS (NMOS) and others is constituted from a P channel MOS (PMOS), this needs to be an example and does not necessarily need to be this passage. Although the terminal of one of these is connected to the gate of TFT11a and the terminal of another side is connected to Vdd (power supply potential), constant potential not only Vdd but arbitrary may be sufficient as the capacity C. The cathode (negative pole) of EL element 15 is connected to earth potentials. Therefore, it cannot be overemphasized that the above matter is applied to drawing 1 etc.

[0254]The terminal voltage of EL element 15 changes also with temperature. Usually, it becomes low as it is high and temperature becomes high, when temperature is low. This tendency has a linear relation. Therefore, it is preferred to adjust Vdd voltage with an outside temperature (correctly temperature of EL element 15). A temperature sensor detects an outside temperature, feedback of a Vdd voltage generation section is applied, and Vdd voltage is changed. Vdd voltage is Centigrade 10 ** change, and it is preferred to make it change 8% or less not less than 2%. It is preferred to consider it as 6% or less not less than 3% especially.

[0255]As for Vdd voltage, such as drawing 1, it is preferred to make it lower than the OFF state voltage of TFT11. Specifically, Vgh (OFF state voltage of a gate) should be made higher than Vdd-0.5(V) at least. When lower than this, off-leak of TFT occurs and the shot nonuniformity of laser annealing comes to be conspicuous. It should be made lower than Vdd+4(V). If too high, the amount of off-leaks will increase conversely. therefore, the OFF state voltage (the voltage side near [in drawing 1] Vgh, i.e., power supply voltage) of a gate -- power supply voltage (drawing 1 Vdd) -- also depending -- it should consider as +4 or less (V) -0.5 or more-(V). The power supply voltage (drawing 1 Vdd) should also make the twist still more preferably +2 or less (V) 0 or more-(V). That is, it is made for the OFF state voltage of TFT impressed to a gate signal line to be enough come by off. When TFT is n channel, Vgl serves as OFF state voltage. Therefore, it is made for Vgl to serve as the -4 or more (V) range of 0.5 or less (V) to GND voltage. -2 or more (V) the thing to do for the range of 0 or less (V) is still more preferably preferred.

[0256]Although the above matter described the pixel configuration of the current programming of drawing 1, it cannot be overemphasized that it does not limit to this and can apply also to the pixel configuration of voltage programs, such as drawing 54, drawing 67, and Drawing 103. As for Vt offset cancellation of a voltage program, it is preferred to compensate every R, G, and B individually.

[0257]The composition of drawing 21 is provided with the following.

The scanning line driving circuit which chooses the scanning lines scanA and scanB one by one.

The data line driving circuit containing current source CS which generates the signal current Iw which has a current level according to brightness information, and is supplied to data-line data one by one.

Two or more pixels which it is allotted to the intersection of each scanning lines scanA and scanB and each data-line data, and contain current drive type EL element 15 which emits light in response to supply of driving current.

[0258]As feature items, the pixel configuration shown in drawing 21, The accession department which incorporates the signal current Iw from the data-line data concerned when the scanning line scanA concerned is chosen, It consists of a converter which once transforms the current level of the incorporated signal current Iw into a voltage level, and holds it, and an actuator which sends the driving current which has a current level according to the held voltage level through the light emitting device OLED15 (it may otherwise be called EL, OEL, PEL, and PLED for short) concerned. Specifically, said accession department consists of transistor TFT11for taking in c.

[0259]Said converter contains the capacity C connected with thin film transistor TFT11a for conversion provided with a gate, sauce, the drain, and the channel at the gate. A gate is made to generate the voltage level which sent through the channel the signal current Iw incorporated by thin film transistor TFT11for conversion a, and the accession department, and was changed, and the voltage level produced in capacity C19-TO is held.

[0260]Said converter contains thin film transistor TFT11d for a switch inserted between the thin film transistor TFT11a drain for conversion, and the gate. Thin film transistor TFT11d for switching flows, when transforming the current level of the signal current Iw into a voltage level, the drain and gate of thin film transistor TFT11a for conversion are electrically connected, and the gate of TFT11a is made to produce the voltage level on the basis of sauce. Thin film transistor TFT11d for a switch is intercepted when holding a voltage level in the capacity C, and it separates the capacity C19 linked to the gate of thin film transistor TFT11a for conversion, and this from the drain of TFT11a.

[0261]Said actuator contains thin film transistor TFT11b for a drive provided with a gate, a drain, sauce, and a channel. The driving current which thin film transistor TFTb for a drive accepts in a gate the voltage level held at the capacity C19, and has a current level according to it is sent through EL element 15 via a channel. The gate of thin film transistor TFT11a for conversion

and the gate of thin film transistor TFT11b for a drive are connected directly, and he constitutes a current mirror circuit, and is trying for the current level of the signal current Iw and the current level of driving current to serve as proportionality.
[0262]The thin film transistor TFT11b for a drive operates in a saturation region, and sends through EL element 15 the driving current according to the difference of the voltage level and threshold voltage which were impressed to the gate.
[0263]Thin film transistor TFT11b for a drive is set up so that the threshold voltage may not become lower than the threshold voltage of thin film transistor TFT11a for conversion corresponding within a pixel. Specifically, TFT11b is set up so that the gate length may not become shorter than the gate length of TFT11A. Or TFT11b may be set up so that the gate dielectric film may not become thinner than the gate dielectric film of TFT11a corresponding within a pixel.
[0264]Or TFT11b may adjust the impurity concentration poured into the channel, and it may set it up so that threshold voltage may not become lower than the threshold voltage of TFT11a corresponding within a pixel. As for TFT11a and TFT11b, both should be turned off, if the signal level of a cutoff level is impressed to the gate of both the thin film transistors by which common connection was carried out when it sets up temporarily so that the threshold voltage of TFT11a and TFT11b may become the same. However, dispersion in a process parameter is also in a pixel slightly actually, and the threshold voltage of TFT11b may become low from the threshold voltage of TFT11a.
[0265]At this time, since the weak current of subthreshold level flows into TFT11b for a drive also with the signal level below a cutoff level, EL element 15 fine-emits light and the contrast drop of a screen appears. Then, gate length of TFT11b is made longer than the gate length of TFT11a. Even if it changes the process parameter of a thin film transistor within a pixel, the threshold voltage of TFT11b is kept from becoming lower than the threshold voltage of TFT11a by this.
[0266]In gate length L, in the comparatively short short-channel-effect field A, Vth goes up with the increase in gate length L. On the other hand, gate length L is not concerned with gate length L in the comparatively big suppression region B, but Vth is almost constant. Gate length of TFT11b is made longer than the gate length of TFT11a using this characteristic. For example, when the gate length of TFT11a is 7 micrometers, the gate length of TFT11b shall be about 10 micrometers.
[0267]While the gate length of TFT11a belongs to the short-channel-effect field A, the gate length of TFT11b may be made to belong to the suppression region B. Thereby, while being able to inhibit the short channel effect in TFT11b, the threshold voltage reduction by change of a process parameter can be controlled. By the above, the leakage current of the subthreshold level which flows into TFT11b can be controlled, fine luminescence of EL element 15 can be suppressed, and it can contribute to a contrast improvement.
[0268]The drive method of the pixel circuit shown in drawing 21 is explained briefly. First, at the time of writing, the 1st scanning line scanA and the 2nd scanning line scanB are made into a selective state. By connecting current source CS to data-line data, where both scanning lines are chosen, the signal current Iw according to brightness information flows into TFT11a. Current source CS is a variable current source controlled according to brightness information. At this time, since it has connected too hastily electrically by TFT11d between the gate drains of TFT11a, (3) types are materialized, and the TFT11a operates in a saturation region. Therefore, between the gate sauce, the voltage Vgs given by (1) formula arises.
[0269]Next, scanA and scanB are changed into a non selection state. In detail, TFT11d is first changed into an off state by making scanB into a low. Vgs is held by this with the capacity C19. Next, since a pixel circuit and data-line data are electrically intercepted by making scanA into a high level and setting to OFF, the writing to another pixel can be performed via data-line data after that. Here, the data which current source CS outputs as a current level of signal current needs to be effective when scanB serves as non selection, but it may be used as arbitrary levels (for example, write data of the following pixel) after that.
[0270]Since common connection of TFT11a, a gate, and the sauce is carried out [both], and TFT11b approaches the inside of a small pixel and is formed, If the TFT11b is operating in the saturation region, the current which flows through TFT11b will be given by (2) formulas, and will turn into the driving current Idd which flows into this [15], i.e., an EL element. What is necessary is just to give sufficient power supply potential to Vdd so that (3) types may be materialized in addition even if it takes into consideration the voltage drop in EL element 15 in order to operate TFT11b in a saturation region.
[0271]Like drawing 1 (b) etc., in order to increase impedance, it cannot be overemphasized that TFT11e and 11 f may be added so that it may illustrate [purpose] to drawing 22. Thus, a better current drive is realizable by adding TFT11e and 11 f. drawing 1 explains other matters -- it comes out and omits.
[0272]Thus, direct current voltage was impressed to EL display device explained by produced drawing 1, drawing 21, etc., and the continuation drive was carried out by the constant current density of 10 mA/cm2. EL structure has checked green (luminescence maximum wavelength lambdamax = 460 nm) luminescence of 7.0V and 200 cd/cm2. A blue light part is luminosity 100cd/cm2, and a color coordinate x= 0.129, y= 0.105, and a green emission part, By luminosity 200 cd/cm2, in x= 0.340, y= 0.625, and a red light part, a color coordinate is luminosity 100cd/cm2, and the color coordinate was acquired for the luminescent color of x= 0.649 and y= 0.338.
[0273]Henceforth, the display, display module and information display device using drawing 1, drawing 21, drawing 43, drawing 71, drawing 22, etc., a drive circuit, a drive method for the same, etc. are explained.
[0274]In a full color organic electroluminescence display panel, improvement in a numerical aperture becomes an important developing theme. It is for the utilization efficiency of light increasing and leading to a rise in luminosity or reinforcement, if a numerical aperture is raised. What is necessary is just to make small area of TFT which interrupts the light from an organic electroluminescence layer, in order to raise a numerical aperture. Low-temperature polycrystal Si-TFT has one 10 to 100 times the performance of this as compared with an amorphous silicon, and since the serviceability of current is high, it can make the size of TFT very small. Therefore, it is preferred to produce a picture element transistor and a circumference drive circuit with low-temperature-polysilicon art in an organic electroluminescence display panel. Of course, although it may form with amorphous silicon art, a pixel numerical aperture will become quite small.
[0275]By forming drive circuits, such as the gate driver 12 or the source driver 14, on the glass substrate 46, the resistance which becomes a problem especially with the organic electroluminescence display panel of a current drive can be lowered. The connection resistance of TCP is lost, and also the leading line from an electrode becomes short 2-3 mm compared with the case of TCP connection, and wiring resistance becomes small. Suppose that there is an advantage whose process for TCP connection is lost that material cost falls.
[0276]Next, the EL display panel or EL display of this invention is explained. Drawing 2 is an explanatory view centering on the

circuit of an EL display. The pixel 16 is arranged or formed in matrix form. The source driver 14 which outputs the current which performs current programming of each pixel to each pixel 16 is connected. The current mirror circuit corresponding to the number of bits of the video signal in the output stage of the source driver 14 is formed. For example, if it is 64 gradation, 63 current mirror circuits are formed in each source signal line, and it is constituted by choosing the number of these current mirror circuits so that desired current can be impressed to the source signal line 18.

[0277]The minimum output current of one current mirror circuit is set to 10 or more nA50nA. Especially the minimum output current of a current mirror circuit is good to use 15 or more nA35nA. It is for securing the accuracy of the transistor which constitutes the current mirror circuit in the driver IC 14.

[0278]The precharge or the discharging circuit which emits or charges the electric charge of the source signal line 18 compulsorily is built in. As for the precharge which emits or charges the electric charge of the source signal line 18 compulsorily, or the voltage (current) output value of a discharging circuit, it is preferred to constitute so that it can set up independently by R, G, and B. the threshold of EL element 15 -- RGB -- things -- he is ** et al.

[0279]It cannot be overemphasized that a pixel configuration, array constitution, panel structure, etc. which were explained above are applied to the composition, method, and device which are explained below. It cannot be overemphasized that a pixel configuration, array constitution, panel structure, etc. which already explained the composition, method, and device which are explained below are applied.

[0280]It is known that an organic EL device has the big temperature dependence characteristic (temperature dependenccy characteristics). In order to adjust the light-emitting-luminance change by these temperature dependenccy characteristics, nonlinear elements, such as a thermo sensitive register to which output current is changed, or posistor, are added to a current mirror circuit, and reference current is created in analog by adjusting change by temperature dependenccy characteristics with said thermo sensitive register.

[0281]In this case, since it is uniquely determined by the EL material to choose, it is not necessary to carry out soft control of the microcomputer etc. in many cases. That is, it may fix to a fixed shift amount etc. with a liquid crystal material. It is important that temperature dependenccy characteristics change with luminescent color materials, and it is the point that it is necessary to perform optimal temperature-dependenccy-characteristics compensation to every luminescent color (R, G, B).

[0282]It is necessary to carry out the temperature dependenccy characteristics of each EL element of R, G, and B into a fixed range. It cannot be overemphasized that it is preferred that there are no temperature dependenccy characteristics of EL element 15 of R, G, and B. at least -- the temperature-dependenccy-characteristics direction of R, G, and B -- a uniform direction -- or it is made not to change Change is change of 10 ** of each color Centigrade, and it is preferred to make it change 8% or less not less than 2%. It is preferred to consider it as 6% or less not less than 3% especially.

[0283]A microcomputer may perform temperature-dependenccy-characteristics compensation. The temperature of an EL display panel is measured with a temperature sensor, and it is made to change with the measured temperature with a microcomputer (not shown) etc. It may control to change reference current etc. automatically by microcomputer control etc. at the time of a change, and to be able to display a specific menu indication. It can constitute so that it can change using a mouse etc. It may constitute so that it can change by using the display screen of an EL display as a touch panel, and displaying a menu, and pressing down a specified part.

[0284]In this invention, a source driver is formed with a semiconductor silicon chip, and is connected with the terminal of the source signal line 18 of the substrate 46 with glass art on chip (COG). As for wiring of signal wires, such as the source signal line 18, metallic wiring, such as chromium, aluminum, and silver, is used. It is because wiring of low resistance is obtained with thin wiring width. Wiring is the material which constitutes the reflection film of a pixel, when a pixel is a reflection type, and forming simultaneously with a reflection film is preferred. It is because it can carry out simple [of the process].

[0285]This invention is good also as composition which does not limit to COG technology, loaded the above-mentioned driver IC 14 etc. into chip one film (COF) art, and was connected with the signal wire of the display panel. Drive IC produces power supply IC102 separately, and is good also as 3 chip configurations.

[0286]A TCF tape may be used. The film for TCF tapes can bond a polyimide film and copper (Cu) foil by thermo-compression, without using adhesives. In addition to this, there are a method which carries out cast molding of the polyimide which dissolved on Cu foil in piles, and a method which attaches Cu by plating or vacuum evaporation on the metal membrane which formed by sputtering on the polyimide film in the film for the TCP tapes which attach Cu to a polyimide film without using adhesives. Although these any may be sufficient, the method of using the TCP tape which attaches Cu to a polyimide film without using adhesives is the most preferred. It corresponds to a lead pitch of 30 micrometers or less with Cu beam laminate sheet not using adhesives. Since the method of forming a Cu layer by plating or vacuum evaporation among Cu beam laminate sheets not using adhesives is suitable for slimming down of the Cu layer, it is advantageous to the minuteness making of a lead pitch.

[0287]On the other hand, the gate driver circuit 12 is formed with low-temperature-polysilicon art. That is, it forms in the same process as TFT of a pixel. This is because an internal structure is easy as compared with the source driver 14 and clock frequency is also low. Therefore, even if it forms with low-temperature polysilicon art, it can form easily, and narrow picture frame-ization can be realized. Of course, it cannot be overemphasized that the gate driver 12 may be formed with a silicon chip, and it may mount on the substrate 46 using COG technology etc. Switching elements, such as the pixel TFT, a gate driver, etc. may be formed by elevated-temperature polysilicon technology, and may be formed with organic materials (organic TFT).

[0288]The gate driver 12 contains the shift register 22b the shift register 22a of **, and for the gate signal line 17a gate signal lines 17b. Each shift register 22 is controlled by the clock signal (CLKxP, CLKxN) of a non-inverter and a negative phase, and a start pulse (STx). In addition, it is preferred to add the enabling (ENABL) signal which controls the output of a gate signal line and a non output, and the up-and-down (UPDWM) signal which carries out the up-and-down inversion of the shift direction. It is preferred to provide the output terminal etc. which otherwise check that the start pulse is shifted and outputted to the shift register. The shift timing of a shift register is controlled by the control signal from control IC (not shown). The level shift circuit which performs the level shift of external data is built in. An inspecting circuit is built in.

[0289]Since the buffer capacity of the shift register 22 is small, the gate signal line 17 cannot be driven directly. Therefore, between the output gates 24 which drive the output and the gate signal line 17 of the shift register 22, at least two or more inverter circuits 23 are formed.

[0290]it is also the same as when forming the source driver 14 directly on the substrate 46 with polysilicon art, such as low-temperature polysilicon, and two or more inverter circuits are formed between the gate of analog switches, such as a transfer gate which drives a source signal line, and the shift register of a source driver. The following matters (the output of a shift register and the output stage (matter about the inverter circuit arranged among output stages, such as an output gate or a transfer gate) which drives a signal wire are matters common to a source drive and a gate drive circuit.) For example, in drawing 2, illustrated as the output of the source driver 14 was directly connected to the source signal line 18, but. Actually, as for the output of the shift register of a source driver, a multi stage inverter circuit is connected and the output of the inverter is connected to the gate of analog switches, such as a transfer gate.
[0291]The inverter circuit 23 comprises a MOS transistor of P channel, and a MOS transistor of N channel. As explained also in advance, the inverter circuit 23 is connected to the outgoing end of the shift register circuit 22 of the gate driver circuit 12 in multistage, and the final output is connected to the output gate 24. The inverter circuit 23 may consist of only P channels. However, it may constitute not as an inverter but as a mere gate circuit in this case.
[0292]The channel width of TFT of P channel which constitutes each inverter circuit 23, or N channel W, Channel length is set to L (in on double-gate **, the width or channel length of a channel who constitutes is added), and the degree of the inverter near the 1 and display side is set to N (eye N stage) for the degree of the inverter near a cyst register.
[0293]Multiplex [of the characteristic difference of the inverter 23 connected if there are many connection number of stageses of the inverter circuit 23] (piled up) is carried out, and a difference arises from the shift register 22 in the transfer time to the output gate 24 (time delay variation). In the case of being extreme, to for example, that [one / the output gate 24a / in drawing 2 / (output voltage has changed) / that / 1.0microsec backward (measuring, after a pulse is outputted from a shift register)]. The state, one [the output gate 24b / 1.5microsec backward (measuring, after a pulse is outputted from a shift register)] (output voltage has changed), arises.
[0294]Therefore, although a direction with more than [little / inverter circuit / 23 / which is produced between the shift register 22 and the output gate 24] is good, gate width W of the channel of TFT which constitutes the output gate 24 is dramatically large. The gate driving ability of the output stage of the cyst register 22 is small. Therefore, it is impossible to drive the output gate 24 directly in the gate circuits (NAND circuit etc.) which constitute a shift register. Therefore, although it is necessary to carry out multi stage connection of the inverter, For example, if the ratio of the size of W4/L4 (channel length of the channel width / P channel of P channel) of the inverter 23d of drawing 2 to the size of W3/L3 of the inverter 23c is large, a time delay will become long and variation will also become [the characteristic of an inverter] large.
[0295]The relation between time delay variation (a dotted line shows) and a time delay ratio (a solid line shows) is shown in drawing 3. (Wn-1/Ln-1) / (Wn/Ln) shows a horizontal axis. For example, L of the inverter 23d and the inverter 23c is the same at drawing 2, and if it is 2W3=W4 (W3/L3), it is /(W4/L4) =0.5. In the graph of drawing 3, a time delay ratio sets the time of (Wn-1 / Ln-1) / (Wn/Ln)=0.5 to 1, and is setting time variation as well as delay to 1.
[0296]It is shown that the connection number of stages of the inverter 23 increases, and time delay variation becomes large, so that (Wn-1 / Ln-1) / (Wn/Ln) becomes large in drawing 3, It is shown that the time delay to the inverter 23 from the inverter 23 to the next step becomes long, so that (Wn-1/Ln-1) / (Wn/Ln) becomes small. It is advantageous on a design to make a time delay ratio and time delay variation into less than two from this graph. Therefore, what is necessary is just to satisfy the conditions of a following formula.
[0297]0.25 The W/L ratio (Wp/Lp) of <=(Wn-1/Ln-1)/(Wn/Ln) <=0.75 and P channel of each inverter 23 and the W/L ratio (Ws/Ls) of n channel need to satisfy the following relations.
[0298]
0.4 If the number of stages n of the inverter 23 formed between output gates (or transfer gate) from the outgoing end of a shift register at <=(Ws/Ls)/(Wp/Lp) <=0.8 pan satisfies a following formula, there is also little variation in a time delay and it is good.
[0299]3 The <= n <= 8 mobility mu has a technical problem. If mobility mun of n channel transistor is small, the size of TG and an inverter will become large and power consumption etc. will become large. The forming face product of a driver becomes large. Therefore, panel size will become large. On the other hand, if large, it will be easy to cause the characteristic degradation of a transistor. Therefore, mobility mun has the following good ranges.
[0300]50 Make the slew rate of the clock signal in <= mun <= 150 and the shift register 22 less than 500v/microsec. When a slew rate is high, degradation of n channel transistor is intense.
[0301]A NAND circuit may be sufficient although it presupposed at the output of the shift register that the inverter 23 is connected to multistage by drawing 2. It is because an inverter can be constituted also from a NAND circuit. That is, what is necessary is just to consider the connection number of stages of a gate with the connection number of stages of the inverter 23. Relations, such as a W/L ratio explained also in this case until now, are applied. The matter explained by the above drawing 2, drawing 3, etc. is applied to drawing 60, drawing 74, drawing 84, etc.
[0302]When the switching transistor of a pixel is P channel in drawing 2 etc., as for ON state voltage, as for the output from the inverter of a final stage, Vgl is impressed to the gate signal line 17, and, as for OFF state voltage, Vgh is impressed to the gate signal line 17. Conversely, when the switching transistor of a pixel is N channel, as for OFF state voltage, as for the output from the inverter of a final stage, Vgl is impressed to the gate signal line 17, and, as for ON state voltage, Vgh is impressed to the gate signal line 17.
[0303]Although it presupposed that a gate driver is produced simultaneously with the pixel 16 with elevated-temperature polysilicon or low-temperature-polysilicon art in the above example, it does not limit to this. For example, source drivers IC 14 and gate driver IC12 produced with the semiconductor chip may be separately loaded into the display panel 82 so that it may illustrate to drawing 26.
[0304]When using the display panel 82 for information display devices, such as a cellular phone, it is preferred to mount the driver ICs 14 and 15 in one side of a display panel, as shown in drawing 26 (the gestalt which mounts a driver IC in one side still in this way is called three-side free composition (structure).). Conventionally, gate driver IC12 was mounted X neighborhood of the viewing area, and the source drivers IC 14 was mounted Y neighborhood. It is because it is easy to design the center line of Screen 21 take the lead in a display and mounting of a driver IC also becomes easy. A gate driver circuit may be produced with composition without three sides by elevated-temperature polysilicon or low-temperature-polysilicon art (it is got blocked and at

least one side is directly formed in the substrate 49 by polysilicon technology among 14 and 12 of drawing 26).
[0305]With three-side free composition, not only the composition that loaded or formed IC in the substrate 49 directly but the composition which stuck on one side (or about one side) of the substrate 49 the films (TCP, TAB art, etc.) which attached ICs 14 and 12 etc. is included. That is, all similar to the composition, the arrangement, or it by which IC is not mounted or attached to two sides are meant.
[0306]If the gate driver 12 is arranged beside the source driver 14 like drawing 26, the neighborhood C meets and it is necessary to form the gate signal line 17 and to form it to the screen display region 21 (references, such as drawing 27).
[0307]The pitch of the gate signal line 17 formed C neighborhood shall be not less than 5 micrometers 12 micrometers or less. In less than 5 micrometers, a noise will ride on a contiguity gate signal line under the influence of parasitic capacitance. According to the experiment, the influence of parasitic capacitance occurs notably at 7micro or less. In less than 5 more micrometers, image noises, such as the shape of a beat, occur violently in a display screen. It is difficult for especially generating of a noise to differ by the right and left of a screen, and to reduce image noises, such as the shape of this beat. If 12 micrometers of reduction are exceeded, the frame width D of a display panel becomes large too much, and is not practical.
[0308]In order to reduce the above-mentioned image noise, it can decrease by arranging the Grant pattern (electric conduction pattern set as fixed voltage at a voltage clamp or the potential stable as a whole) in the lower layer or the upper layer of a portion in which the gate signal line 17 was formed. What is necessary is just to arrange the shield plate (shield foil (electric conduction pattern set as fixed voltage at a voltage clamp or the potential stable as a whole)) formed separately on the gate signal line 17.
[0309]Although the gate signal line 17 of C neighborhood of drawing 26 may be formed with an ITO electrode, in order to low-resistance-ize, it is preferred to laminate and form ITO and a metal thin film. Forming with a metal membrane is preferred. When laminating with ITO, a titanium film is formed on ITO and the alloy thin film of aluminum or aluminum, and molybdenum is formed on it. Or a chromium film is formed on ITO. In the case of a metal membrane, it forms with an aluminum thin film and a chrome thin film. The above matter is the same in other examples of this invention.
[0310]In drawing 27 etc., although it presupposes that the wiring 17 is arranged in one side of a viewing area, it may not be limited to this, and it may be arranged to both. For example, the gate signal line 17a may be arranged on the right-hand side of the viewing area 21 (formation), and the gate signal line 17b may be arranged on the left-hand side of the viewing area 21 (formation). The above matter is the same in other examples.
[0311]In drawing 30, 1 chip making (1 chip driver IC14a) of source drivers IC 14 and gate driver IC12 is carried out. If 1 chip making is carried out, mounting of the IC chip to the display panel 82 can be managed with one piece. Therefore, implementation cost can also be reduced. The various voltage used within 1 chip driver IC can also be generated simultaneously.
[0312]It is not what is limited to this although source drivers IC 14 and gate driver IC12 and 1 chip driver IC14a are produced with semiconductor wafers, such as silicon, and being mounted in the display panel 82, It cannot be overemphasized that it may form in the display panel 82 directly by low-temperature-polysilicon art and elevated-temperature polysilicon technology.
[0313]drawing 28 -- the both ends of the source drivers IC 14 -- gate driver IC12a and 15b -- mounting (or it forms) -- although carried out, it is not limiting to this, either. For example, as shown in drawing 26, while adjoined the source drivers IC 14 and one gate driver IC12 may be arranged to a side. The part illustrated as the thick solid line in drawing 26 etc. shows the part which the gate signal line 17 arranged in parallel and formed. Therefore, the gate signal line 17 for the number of a scanning signal line arranges in parallel the portion (bottom of screen) of b, it is formed, and, as for the portion (upper part of a screen) of a, the one gate signal line 17 is formed.
[0314]if the two gate drivers 12a and 12b are used like drawing 28, the number of the gate signal line 17a which is arranged in parallel C neighborhood of drawing 28, and is formed will be set to one half of the number of scanning lines (the right and left of a screen -- 1/of the number of gate signal lines -- it is because it can arrange every [2]). Therefore, it cannot be overemphasized that there is the feature that a frame becomes equivalent by the right and left of a screen.
[0315]This invention has the feature also in the scanning direction of the gate signal line 17, and a screen separation. For example, the gate driver 12a is connected with the gate signal line 17b of the upper part of a screen in drawing 28. The gate driver 12b is connected with the gate signal line 17a of the bottom of screen. As the arrow A also shows the scanning direction of the gate signal line 17, it is the direction of the upper part of a screen to the lower part. The source signal line 18 is common to the upper part of a screen, and a bottom of screen.
[0316]In drawing 29, it is connected so that the gate driver 12a may differ from the gate signal line 17 with which the upper part of a screen adjoined. The gate driver 12a is connected with odd-numbered gate signal line b. The gate driver 12b is connected with the even-numbered gate signal line 17a. The gate signal line 17b of the scanning direction of a gate signal line is the direction of the upper part of a screen to the lower part (arrow A). The gate signal line 17a is the direction of a bottom of screen to the upper part (arrow B). Thus, by connecting the gate signal line 17 with gate driver IC12, by making the scan method of a gate signal line into a predetermined direction, a luminosity inclination does not occur on Screen 21, but generating of a flicker can also be controlled again.
[0317]The source signal line 18 is common to the upper part of a screen, and a bottom of screen. However, it cannot be overemphasized that it may divide by the upper and lower sides of a screen. The above matter is applied to other examples.
[0318]The gate driver 12a is connected with the gate signal line 17b of the upper part of a screen in drawing 30. The gate driver 12b is connected with the gate signal line 17a of the bottom of screen. The scanning direction of the gate signal line 17b is the direction of the upper part of a screen to the lower part, as the arrow A shows. The scanning direction of the gate signal line 17a is the direction of the lower part of a screen to the upper part, as the arrow B shows. The source signal line 18 is common to the upper part of a screen, and a bottom of screen. Thus, by connecting the gate signal line 17 with gate driver IC12, by making the scan method of a gate signal line into a predetermined direction, a luminosity inclination does not occur on Screen 21, but generating of a flicker can also be controlled again.
[0319]In drawing 30, 1 chip making (1 chip driver IC14a) of source drivers IC 14 and gate driver IC12 is carried out. If 1 chip making is carried out, mounting of the IC chip to the display panel 82 can be managed with one piece. Therefore, implementation cost can also be reduced. The various voltage used within 1 chip driver IC can also be generated simultaneously. It cannot be overemphasized that 1 chip driver IC14a may be produced with semiconductor wafers, such as silicon, it may not limit to this

although mounted in the display panel 82, and it may form in the display panel 82 directly by low-temperature-polysilicon art and elevated-temperature polysilicon technology. It cannot be overemphasized that the driver IC which drives the upper part of a screen may be arranged to the top chord of a display screen, and the driver IC which drives the lower part of a screen may be arranged to the lower side of a display screen (getting it blocked, mounting IC serves as two chips). The above matter is applied also to the example of other this inventions.

[0320]In drawing 28 and drawing 30, it expressed so that a screen might be divided in the center section, but it does not limit to this. For example, in the case of drawing 28, the display screen 21a may be made small, and it may enlarge the display screen 21b. Let the display screen 21a be a partialness viewing area (refer to Drawing 110). A partialness viewing area mainly performs a time stamp and a date display. A partialness viewing area is used in low-power-consumption mode. In drawing 28 and drawing 30, the viewing area 21a is displayed with the gate signal line 17b, and the viewing area 21b is displayed with the gate signal line 17a.

[0321]As illustrated in Drawing 111 in Drawing 110, it is good also as composition which considers the viewing area 21a as composition without three sides, and arranges the conventional source driver 14 and the gate driver 12 for the viewing area 21b the separate neighborhood. That is, the gate signal line 17a and the source signal line 18a are outputted from 1 chip driver IC14a.

[0322]The viewing area 21 may be divided into two fields, 21a and 21b, so that it may illustrate to Drawing 114, and the source drivers IC 14 corresponding to each field and the gate driver 12 may be arranged. Since the writing time of the video signal outputted from each source driver 14 in Drawing 114 doubles as compared with other examples, a signal can fully be written in a pixel. The viewing area 21 may be set to one and may arrange the one source drivers IC 14 each to the upper and lower sides of a screen so that it may illustrate to Drawing 113. This is applicable similarly to gate driver IC12.

[0323]Although it was the composition of the above example having formed the gate signal line 17 in parallel, and wiring to a picture element region, it cannot be overemphasized that the source signal line 18 may be constituted so that it may wire in parallel with one side so that it may not limit to this and may illustrate to Drawing 112.

[0324]In Drawing 110, Drawing 111, Drawing 114, etc., it is also a means effective in low power consumption to change a frame rate (drive frequency or number of times of screen rewriting per unit time (for 1 second)) by the viewing areas 21a and 21b. It is also effective in low power consumption to change display color numbers or a foreground color by the viewing areas 21a and 21b.

[0325]The cathode of EL element 15 is connected to Vs1 potential with the composition illustrated by drawing 1. However, there is a problem that the driver voltages of the organic electroluminescence which constitutes each color differ. For example, when the current of 0.01 (A) per unit square centimeter is sent, in blue (B), the terminal voltage of an EL element is 5(V), but in green (G) and red (R), they are 9(V)s. That is, terminal voltage differs by B, G, and R. Therefore, in B, G, and R, the sauce drain voltage (SD voltage) of 11c11 d of transistors to hold differs. Therefore, the sauce drain voltage (SD voltage) OFF leakage current of a transistor will differ in each color. If OFF leakage current occurs and OFF leakage characteristics differ in each color, it will become about the complicated displaying condition which a flicker generates after color balance has shifted that correlate with the luminescent color and the gamma characteristic shifts.

[0326]In order to cope with this technical problem, it constitutes from this invention so that it may illustrate to drawing 5, and the potential of one cathode terminal may be changed with the potential of the cathode terminal of other colors among R, G, and B color at least. By drawing 5, B is used as the cathode terminal 53a, and, specifically, G and R are used as the cathode terminal 53b. Although drawing 5 assumes lower extraction which takes out light from a glass surface, there is also a case of upper extraction. In this case, a cathode and an anode may become the reversed composition.

[0327]It cannot be overemphasized that it is preferred to make it in agreement as much as possible as for the terminal voltage of EL element 15 of R, G, and B. At least, white peak luminosity is displayed, and in the or more 6000K9000K or less range, as for the terminal voltage of the EL element of R, G, and B, a color temperature needs to carry out material or structure selection so that it may become 10 or less (V). ** of R, G, and B -- it is necessary to make the difference of the greatest terminal voltage of an EL element, and the minimum terminal voltage into less than 2.5 (V) among them It is necessary to make it 1.5 or less (V) still more preferably. In the above example, although the color was set to RGB, it is not limited to this. This is explained later.

[0328]Amendment of color unevenness is also required. This is generated by the variation in thickness, and the variation of the characteristic in order to distinguish the EL material of each color by different color with. performing a white raster display by 70% of luminosity 30%, in order to amend this -- the field of each color in the viewing area 21 -- internal division -- cloth is measured. The distribution within a field is measured one point respectively to at least 30 pixels. This measurement data is saved on the table which consists of memories, and this saved data is used, and it constitutes so that inputted image data may be amended and it may display on the display screen 21.

[0329]Although a pixel is made into the three primary colors of R, G, and B, it may not be limited to this, and three colors of cyanogen, yellow, and magenta may be sufficient as it. Two colors of B and yellow may be sufficient. Of course, monochrome may be sufficient. Six colors of R, G, B, cyanogen, yellow, and magenta may be sufficient. Five colors of R, G, B, cyanogen, and magenta may be sufficient. A color reproduction range expands these as a natural color, and they can realize a good display. In addition, four colors of R, G, B, and white may be sufficient. Moreover seven colors of R, G, B, cyanogen, yellow, magenta, black, and white may be sufficient, the pixel of white light is formed in the viewing-area 21 whole (production), and it is good also as a three-primary-colors display at light filters, such as RGB. In this case, what is necessary is to laminate the luminescent material of each color to an EL layer, and just to form in it. 1 pixel may be distinguished by different color with like B and yellow. The EL display of this invention is not limited to what performs a colored presentation by the three primary colors of RGB as mentioned above.

[0330]There are mainly three methods in colorization of an organic electroluminescence display panel, and a convert-colors method is one of these. What is necessary is just to form the monolayer of a blue chisel as a luminous layer, and the remaining green and red required for full-color-izing are made by convert colors from blue glow. Therefore, there is an advantage which does not need to distinguish each class of RGB by different color with that it is not necessary to prepare the organic electroluminescence material of each color of RGB. A convert-colors method is distinguished by different color with, and it does

not have ********** so that it may be a method. The EL display panel of this invention is applied by any of this method.
[0331]The pixel 16W of white light other than the three primary colors may be formed so that it may illustrate to Drawing 168. The pixel 16W of white light is realizable by producing from that of laminating the structure of R, G, and B luminescence (formation or composition). 1 set of pixels consist of the three primary colors of RGB, and the pixels 16W of white light. It becomes easy to express white peak luminance by forming the pixel of white light. therefore, there is a feeling of brightness -- image display realization can be carried out.
[0332]As for the area of the picture element electrode of each color, it is preferred to make it differ so that it may illustrate to Drawing 169, even if it is the three primary colors, such as RGB, a case where 1 set of pixels are carried out. Of course, balance of the luminous efficiency of each color may be good, and an identical area may be sufficient as long as balance also avoids color purity. However, if the balance of one or more colors is bad, it is preferred to adjust a picture element electrode (emission area). The electrode area of each color should just determine current density as a standard. That is, when a color temperature adjusts a white balance in the 9000K or less range more than 6000K (kelvin), it is made for the difference of the current density of each color to be less than **30%. It is made to become less than **15% still more preferably. For example, if current density carries out 100A / square meter, it will be made for each three primary colors to be less than a more than 70A/square meter 130A/square meter. It is made for each three primary colors to be less than a more than 85A/square meter 115A/square meter still more preferably.
[0333]It is preferred to arrange by the pixel row which adjoined so that trichromatic arrangement may differ so that it may illustrate to Drawing 170. For example, from the left, if the eventh line is arrangement of R, G, and B, it will consider the oddth line as arrangement of B, G, and R. By arranging in this way, the resolution of the oblique direction of a picture is improved also with a small pixel number. The 1st line may be considered as arrangement of R, G, B, R, G, and B from the left, the 2nd line may be considered as arrangement of G, B, R, G, B, and R, and pixel arrangement may be changed by three or more pixel rows so that the 3rd line may be considered as arrangement of B, R, G, B, R, and G.
[0334]The cathode terminal 53a is formed using the metal mask art which distinguished the organic electroluminescence of each color by different color with. A metal mask is used because organic electroluminescence cannot perform etching etc. in water weakly. Using a metal mask (not shown), the cathode terminal 53a is vapor-deposited and connection is taken simultaneously in the contact hole 52a. The B cathode wiring 51a and an electrical link can be taken by the contact hole 52a.
[0335]The cathode terminal 53b is similarly formed using the metal mask art which distinguished the organic electroluminescence of each color by different color with. Using a metal mask (not shown), the cathode terminal 53b is vapor-deposited and connection is taken simultaneously in the contact hole 52b. The RG cathode wiring 51b and an electrical link can be taken by the contact hole 52b. The aluminum film thickness of a cathode terminal is good to form so that it may be set to not less than 70 nm 200 nm or less.
[0336]Since different voltage can be impressed to the cathode terminals 51a and 51b by the above composition, even if the Vdd voltage of drawing 1 is common to each color, the voltage impressed to EL of at least 1 color among RGB can be changed. At drawing 5, although it is considered as the same cathode terminal 53b, it may not limit to this, and it may constitute from RG so that it may become a cathode terminal which differs by R and G.
[0337]By constituting as mentioned above, in each color, the OFF leakage current between the sauce drain voltage (SD voltage) of a transistor can occur, and a kink phenomenon can be prevented. Therefore, a flicker does not have generating, it does not correlate with the luminescent color, the gamma characteristic does not necessarily shift, and good image display can be realized.
[0338]It cannot be overemphasized that Vs1 of drawing 1 may be made into cathode voltage, it may not limit to this although it presupposes that this cathode voltage is made to differ in each color, and the anode voltage Vdd may be constituted so that it may differ in each color. For example, it is the composition which makes Vdd of the pixel of R voltage 8(V), makes G 6(V)s and makes B 10(V)s. As for such anode voltage and cathode voltage, it is preferred to constitute so that it can adjust in the range of **1(V).
[0339]Even if panel size is about 2 inches, about 100-mA current is outputted from the anode connected with Vdd. Therefore, low-resistance-izing of the anode wiring 20 (current supply source line) is indispensable. In order to cope with this technical problem, by this invention, anode 63 wiring is supplied from viewing-area the upper part and the bottom so that it may illustrate by drawing 6 (both-ends electric supply). Generating of the luminosity inclination by the upper and lower sides of a screen is lost by carrying out both-ends electric supply as mentioned above.
[0340]In order to raise light emitting luminance, it is good to carry out surface roughening of the pixel 48. This composition is shown in drawing 7. First, the La Stampa art is used for the part which forms the picture element electrode 48, and detailed unevenness is formed in it. When a pixel is a reflection type, the metal thin film of about 200-nm aluminum is formed by sputtering process, and the picture element electrode 48 is formed. Surface roughening of the heights is provided and carried out to the part where the picture element electrode 48 touches organic electroluminescence. In the case of a simple matrix type display panel, the picture electrode 48 makes it the shape of a stripe like electrode. Heights may not be limited only to convex and a concave may be sufficient as them. Concave and a convex may be formed simultaneously.
[0341]The size of the projection was about 4 micrometers in diameter, set the average value of the distance between contiguity to 10 micrometers, 20 micrometers, and 40 micrometers, and performed the 120 measurement of luminance/mm for the unit area density of the projection from 1000 to 1200 pieces/square milimeter and 100 as 2 and 600 to 800 pieces/square milimeter, respectively. Then, it turned out that light emitting luminance becomes strong, so that the unit area density of the projection became large. Therefore, it turned out that the surface state of a picture element electrode is changed and light emitting luminance can be adjusted by changing the unit area density of the projection on the picture element electrode 48. According to examination, the result good in 800 or less pieces [100 or less //square milimeter]/square milimeter was able to be obtained for the unit area density of the projection.
[0342]Organic electroluminescence is a self-light emitting device. If the light by this luminescence enters into TFT as a switching element, a phot conductor phenomena (contest the phot) will occur. In contest a phot, the phenomenon whose leak (off-leak) in the time of OFF of switching elements, such as TFT, increases by optical pumping is said.
[0343]In order to cope with this technical problem, as shown in drawing 9, by this invention, the lower layer of the gate driver 12

(depending on the case, it is the source driver 14) and the lower layer light-shielding film 91 of the picture element transistor 11 are formed. The light-shielding film 91 is formed with metal thin films, such as chromium, and sets the thickness to not less than 50 nm 150 nm or less. If thick [when thickness is thin, shielding effects are scarce, and], unevenness will occur and patterning of TFT11A1 of the upper layer will become difficult.
[0344]The smoothing film 71a which consists of or more 20 an inorganic material of 100 nm or less is formed on the light-shielding film 91. One electrode of the storage capacitance 19 may be formed using the layer of this light-shielding film 91. In this case, as for the smooth film 71a, it is preferred to enlarge capacity value of structure storage capacitance thinly as much as possible. The light-shielding film 91 may be formed with aluminum, a silicon oxide film may be formed in the surface of the light-shielding film 91 using anodization art, and this silicon oxide film may be used as a dielectric film of the storage capacitance 19. On the smoothing film 71b, the picture element electrode of a high aperture (HA) structure is formed.
[0345]The driver circuit 12 should control not only a rear face but penetration of the light from the surface. It is because it malfunctions under the influence of contest a phot. Therefore, in this invention, when a cathode terminal is a metal membrane, a cathode terminal is formed also in the surfaces, such as the driver 12, and this electrode is used as a light-shielding film.
[0346]However, if a cathode terminal is formed on the driver 12, malfunction of the driver by the electric field from this cathode terminal or the electric interengagement of a cathode terminal and a driver circuit may occur. In order to cope with this technical problem, in this invention, at least one layer of organic electroluminescence films of two or more layers are preferably formed simultaneously with the organic electroluminescence film formation on a picture element electrode on the driver circuit 12 etc.
[0347]Fundamentally, since an organic electroluminescence film is an insulating material, between a cathode and a driver is isolated by forming an organic electroluminescence film on a driver. Therefore, the above-mentioned technical problem is cancelable.
[0348]If between the terminals of one or more TFT11 of a pixel, or TFT11 and a signal wire short-circuit, EL element 15 may always serve as a luminescent spot to turn on. Since this luminescent spot is visually conspicuous, it is necessary to sunspot-ize it (astigmatism light). To a luminescent spot, the applicable pixel 16 is detected, the capacitor 19 is irradiated with a laser beam, and between the terminals of a capacitor is short-circuited. Therefore, since it becomes impossible to hold an electric charge to the capacitor 19, TFT11a can be made not to send current.
[0349]It corresponds to the position which irradiates with a laser beam. It is desirable to remove a cathode film. It is to prevent the terminal electrode and cathode film of the capacitor 19 from short-circuiting by laser radiation.
[0350]The defect of TFT11 of the pixel 16 affects the driver IC 14 etc. For example, in Drawing 392, if the sauce drain (SD) short circuit has occurred in drive TFT11a, the Vdd voltage of a panel will be impressed to IC14. or [therefore, / that the power supply voltage of IC14 is the same as the power supply voltage Vdd of a panel] -- or it is preferred to make it high.
[0351]IC14 is destroyed if voltage higher than the power supply voltage of IC14 is impressed to IC. Therefore, the point defect inspection of the pixel 16 of a panel is important.
[0352]Drawing 393 is an explanatory view of the method of a point defect inspection of a pixel. In Drawing 393, the picture element electrode 16 is illustrated as it short-circuited to Grant, but it is not limited to this. It is for explaining easily. The gate signal line 17b of plurality [array / by which two or more pixels 16 were formed in matrix form] is formed in the short condition with the short ring 3931. It dissociates according to gate signal line 17 a pieces.
[0353]Prow BIINGU of the probe 3935 is carried out at the terminal electrode 3933 formed in the end of the gate signal line 17a (arrangement). Prow BIINGU of the probe 3934 is carried out at the terminal electrode 3932 formed in the end of the gate signal line 17b (arrangement). As for the probes 3934 and 3935, it is desirable to carry out to all the gate signal lines 17a and the source signal line 18. However, when it cannot do, partial prow BIINGU may be sufficient.
[0354]OFF state voltage is continuously impressed to the short ring 3931. Therefore, TFT11d of the pixel 16 is an OFF state continuously. Therefore, even if the EL film 47 is formed on the picture element electrode 48, there is no current path which flows into EL element 15. Of course, when the EL film 47 is not formed, there is no current route from a picture element electrode to a cathode.
[0355]It carries out one pixel row of inspections of a pixel at a time. First, ON state voltage is impressed to the terminal electrode 3933a from the probe 3935a. Then, TFT11b of the pixel of 1 pixel-row eye and 11c will be in an ON state, and the current path to the gate (G) terminal (G) of drive TFT11a is formed. OFF state voltage is impressed to the terminal electrode (3933b, 3933c) of other pixel rows.
[0356]In this state, Vdd voltage (or that neighborhood) is impressed to the terminal electrode 3932 via the probe 3934. Next, the potential of the terminal electrode 3932 is reduced via the probe 3934, and if TFT11a is normal, the voltage of the level through which slight current flows or which is not poured at all will be impressed to each source signal line 18. Current does not flow into the terminal electrode 3932 in this state. Therefore, it is detectable that all 1 pixel-row eyes have a normal pixel.
[0357]Next, ON state voltage is impressed to the terminal electrode 3933b from the probe 3935b. Then, TFT11b of the pixel of 2 pixel-row eye and 11c will be in an ON state, and the current path to the gate (G) terminal (G) of drive TFT11a is formed. OFF state voltage is impressed to the terminal electrode (3933a, 3933c) of other pixel rows.
[0358]In this state, Vdd voltage (or that neighborhood) is impressed to the terminal electrode 3932 via the probe 3934. Next, the potential of the terminal electrode 3932 is reduced via the probe 3934 like the point, and if TFT11a is normal, the voltage of the level through which slight current flows or which is not poured at all will be impressed to each source signal line 18. However, since SD short circuit has occurred in the pixel 16k at TFT11a, it is generated by the current path Iw which flows into the terminal electrode 3932b from Vdd voltage. Therefore, it is detectable that the defect has occurred in the pixel 16k. Defect inspection of a pixel can be conducted by carrying out one pixel row of the above operation at a time.
[0359]Two or more gate signal lines 17a may be formed in a short condition with the 1st short ring 3931, and two or more gate signal lines 17b may be formed in a short condition with the 2nd short ring 3931. In this case, impress OFF state voltage to the 2nd short ring 3931 continuously, and ON state voltage is first impressed to the 1st short ring 3931, What is necessary is to make potential of the source signal line 18 into low voltage, and just to measure the existence of current which flows into each source signal line 18, after writing Vdd (voltage through which it is got blocked and drive TFT11a does not send current) in each pixel.

[0360]In Drawing 393 etc., although the probes 3935 and 3932 etc. are contacted to the terminal electrodes 3933 and 3934, this is not limited to a probe. For example, the flexible substrate etc. in which the gold bump was formed may be sufficient. Electric interengagement (connection) is taken from that of contacting a gold bump to a terminal electrode. Of course, it is very good in contact electromagnetically or electrostatically. In addition, the electronic detection system which detects the electron emitted from a terminal electrode etc. may be used. Light emitting devices, such as luminescence LED, may be formed or connected to the terminal, and the method which detects a defect from the existence of luminescence of this luminescence LED may be used. That is, it is [anything] good if current or voltage etc. which flows carrying out prow BIINGU into a signal wire or a terminal electrode is detectable.
[0361]In addition, two or more terminal electrodes are short-circuited with the short ring, and detection means, such as current, are connected to this short part. Next, it may inspect by separating from a short ring using laser etc. Such an inspection system is also a category of prow BIINGU in the inspection of this invention.
[0362]If SD short circuit has occurred in TFT11a, excessive current will flow into EL element 15. That is, EL element 15 will always be in a lighted condition (luminescent spot). A luminescent spot is conspicuous as a defect. For example, in Drawing 394, if the sauce drain (SD) short circuit of TFT11a has occurred, it is not concerned with the size of the gate (G) terminal potential of TFT11a, but current will always flow into EL element 15 from Vdd voltage (when TFT11d is one). Therefore, it becomes a luminescent spot.
[0363]On the other hand, when SD short circuit has occurred in TFT11a and TFT11c is an ON state, Vdd voltage is impressed to the source signal line 18, and Vdd voltage is impressed to the source driver 14. If the power supply voltage of the source driver 14 is below Vdd, there is a possibility that the source driver 14 may be destroyed, exceeding pressure-proofing. Therefore, as for the power supply voltage of the source driver 14, it is preferred to carry out more than Vdd voltage (voltage of the one where a panel is more expensive).
[0364]SD short circuit of TFT11a does not remain in a point defect, but has a possibility of leading the source driver circuit of a panel to destruction, and since a luminescent spot is conspicuous, it becomes poor as a panel. Therefore, it is necessary to cut wiring in the cutting part 3941 of Drawing 394, and to make a luminescent spot into a sunspot defect. It is good for this cutting to cut using optical means, such as a laser beam. The method which is not limited to laser, condenses the light generated from a xenon lamp etc., and cuts wiring of the cutting part 3941 with this light that condensed may be sufficient as an optical means. The method of cutting by a sandblasting method (the sand of particles is sprayed and cut) may be adopted as the cutting part 3941. That is, anything may be used as a cutting means. However, the method of using optical means, such as laser, is processible into the cutting part 3941 by non-contact, and preferred.
[0365]As for the laser beam 3952, it is more preferred than the thing of a continuous method to adopt the thing of a pulse oscillation which used the Q switch. It is made for two or more laser pulses to be irradiated by the cutting part. And as for the pulse interval of laser, it is preferred to use 100 or less msec of 0.1 or more msec. It is preferred to use especially 10 or less msec more than per msec. It is because the molten state of the working point by the laser beam with which it irradiated previously is continuing in this interval and good cutting or processing can be carried out. As for the wavelength of a laser beam, around 1 micrometer is preferred. An YAG laser is illustrated as laser of this wavelength. Of course, other laser may be used. For example, carbon dioxide laser, an excimer laser, a neon helium laser, etc. are illustrated.
[0366]Drawing 395 shows the method of cutting by irradiating the cutting part 3941 with the laser beam 3952 which the laser irradiation apparatus 3951 generates. However, the metal membrane 46 which constitutes a cathode by the exposure of the laser beam 3952 is torn greatly. Or the drain (D) terminal and the cathode terminal 46 of TFT11a may contact and receive. In order to cope with this problem, the opening 3953 is formed in the cathode film 46 of the part corresponding to the cutting part 3941 in this invention (refer to Drawing 396). The cutting part 3941 is located in the lower layer of this opening 3953. Therefore, however, even if it irradiates with the laser beam 3952, the cathode film 49 is not formed in the exposure part. Therefore, whether the irradiation intensity of the laser beam 3952 is strong or a drain (D) terminal causes film peeling, it does not short-circuit with the cathode film 49. It is not what is limited to this although the opening 3953 was made into one place to each pixel 16 in Drawing 396, The ** should just form the opening 3953 according to a cut position, when [which is others] TFT needs to suit (for example, TFT11b, TFT11c, TFT11d, etc.) and it is necessary to cut other cutting parts of TFT11a. It irradiates with the laser beam 3952 from the transparent substrate 49 side in which TFT element 11 was formed (conversely, to irradiate with the laser beam 3952 from the cathode 49 side, since the cathode 49 is formed with the metal membrane, it needs to process first the cathode terminal 49 which is a metal membrane.). However, like this invention, when the opening 3953 is formed, since it can irradiate with the laser beam 3952 from this opening 3953, it can also irradiate with the laser beam 3953 from the cathode 49 side.
[0367]The above example is an example which cuts the terminal of TFT11, etc. However, a cutting part is not limited in this case. For example, also when the source signal line is connected with the picture element electrode, it is necessary to cut a connected part. Even in this case, it is preferred to remove the cathode film 49 of the part where cutting is predicted (assumption), and to form the opening 3953. Although it presupposed that the opening 3953 is formed in the cathode film 49 in the above example, it does not limit to this. For example, an EL element may be [which forms the opening 3953] in an anode film constitutionally. That is, it is a technical category of this invention that this invention removes the electrode layer located in the portion with which a laser beam etc. are irradiated.
[0368]It was the method of cutting the terminal of TFT11, etc. in the example of Drawing 394 etc., and correcting a defect (when considering it as a luminescent spot and a sunspot etc.). However, the method of making it into a sunspot is not limited to this. For example, even if it short-circuits EL element 15 (it should probably be actually called EL film) so that it may illustrate to Drawing 397, it can change into a sunspot (astigmatism light) state. That is, a picture element electrode and a cathode terminal are made to short-circuit.
[0369]In this case, since it aims at a short circuit, it irradiates with the laser beam 3952 from the cathode film 46 side, and the cathode film 46 and the picture element electrode 48 are made to short-circuit so that it may illustrate to Drawing 398. Of course, the laser 3952 may be made to glare and short-circuit in the direction of the cathode film 46 from the picture element electrode 48 side. However, when the picture element electrode 48 is formed with transparent electrodes, such as ITO (IZO), it is hard to perform a short circuit with the picture element electrode 48 and the cathode terminal 46 good. When the picture

element electrode 48 is formed with metallic materials, such as aluminum, a short circuit with the picture element electrode 48 and the cathode terminal 46 is performed good. That is, the direction of radiation of laser is good to glare from the metallic material side of a shorting part. Of course, since a metal membrane and a picture element electrode are short-circuited, some intensity of the laser beam 3952 is good in it being strong.

[0370]Although the above example presupposed that a metal membrane and picture element electrodes, such as a cathode, are short-circuited, in order to indicate by black, it is not limited to this. For example, the power supply Vdd of TFT11a may correct so that it may always be impressed by the gate (G) terminal of TFT11a, so that it may understand also by drawing 1. For example, if it makes inter-electrode [of the capacitor 19 / two] short-circuit, Vdd voltage will come to be impressed to the gate (G) terminal of TFT11a. Therefore, TFT11a is turned off thoroughly and can be made not to send current to EL element 15. If absorbed, since a capacitor electrode can be short-circuited by irradiating the capacitor 19 with the laser beam 3952, it is easily realizable. Actually, since Vdd wiring is arranged at the lower layer of the picture element electrode, the displaying condition of a pixel is controllable by irradiating Vdd wiring and a picture element electrode with the laser beam 3952 (correction).

[0371]In addition, making between SD (channel) of TFT11a open can also be realized. TFT11a is simply irradiated with the laser beam 3952, and the channel of TFT11a is made open. Similarly, the channel of TFT11d may be made open. Of course, since the applicable pixel 16 is not chosen even if it opens the channel of TFT11b, it becomes a black display.

[0372]In order to indicate the pixel 16 by black, EL element 15 may be degraded. For example, EL layer 47 is irradiated with the laser beam 3952, EL layer 47 is degraded physically or chemically, and it is made not to emit light so that it may illustrate to Drawing 399 (regular black display). EL layer 47 can be heated by the exposure of the laser beam 3952, and it can be made to deteriorate easily. If an excimer laser is used, the chemical change of the EL film 47 can be performed easily.

[0373]Although the above example illustrated the pixel configuration illustrated to drawing 1, this invention is not limited to this. It cannot be overemphasized that it is applicable even if it is a pixel configuration of current mirrors, such as drawing 21, to use the laser beam 3952 and to make wiring or an electrode open or short-circuit. It cannot be overemphasized that it is applicable also to the pixel configuration of a voltage drive of drawing 54, drawing 67, drawing 68, Drawing 103, etc.

[0374]As the directions for laser, it is not limited to limiting to the short circuit of cutting of a cutting part, or a metal membrane. For example, EL film of an organic electroluminescence display is weak for moisture. Therefore, the closure lid 41 is attached to the substrate 49 so that it may illustrate to Drawing 398, and it prevents with permeation of the moisture from the outside (control). However, it is not perfect to control moisture only with the closure lid 41. Therefore, the drier (water absorption agent) is put in between the closure lid 41 and the substrate 49. The moisture which invaded from the outside with this drier is adsorbed, and internal moisture is absorbed.

[0375]If laser is used, it can overheat easily with the substrate 49 and the water absorption agent arranged between the closure lids 41. That is, even if it is after closure, a water absorption agent can be overheated by laser and it can change into the state of being easier to absorb moisture. Of course, a water absorption agent is overheated before closure (before pasting the closure lid 41 and the substrate 49 together), and after changing a water absorption agent into the state of being easier to absorb moisture, it can close.

[0376]In addition, the laser can make pasting easy by irradiating the photo-curing resin which pastes the closure lid 41 and the substrate 49 together. That is, after applying photo-curing resin to the part which pastes the closure lid 41 and the substrate 49 together, the closure lid 41 and the substrate 49 are pasted together. Photo-curing resin is stiffened by irradiating this photo-curing resin with the laser beam 3952.

[0377]The structure illustrated to Drawing 175 is also illustrated. Drawing 175 shows the example of the lower extraction structure which takes out light from the glass substrate 49 side. Also in Drawing 175, the lower layer of the gate driver 12 (depending on the case, it is the source driver 14) and the lower layer light-shielding film of the picture element transistor 11 are formed. Forming a light-shielding film with metal thin films, such as chromium, the thickness shall be not less than 50 nm 150 nm or less. If thick [when thickness is thin, shielding effects are scarce, and], unevenness will occur and patterning of TFT11A1 of the upper layer will become difficult.

[0378]TFT11 and the driver circuit 12 (14) are formed on a light-shielding film. The driver circuit 12 (14) should control not only a rear face but penetration of the light from the surface. It is because it malfunctions under the influence of contest a phot. Therefore, in this invention, the cathode terminal 46 is used as a light-shielding film.

[0379]However, if a cathode terminal is formed on the driver 12 (14), malfunction of the driver by the electric field from this cathode terminal or the electric interengagement of a cathode terminal and a driver circuit may occur. In order to cope with this technical problem, in this invention, at least one layer of organic electroluminescence films of two or more layers are preferably formed simultaneously with the organic electroluminescence film formation on a picture element electrode on the driver circuit 12 etc.